Impact of Mobile Technology on Students' Achievements in Higher Education

Research Report

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Statement of authenticity

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Neha Rani

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Abstract

Mobile technology is changing the way of learning and can be a powerful tool for transforming education. It can reinforce and develop relationships between teachers and students, reshape our learning and collaboration approaches, reduce long-standing differences in equity and usability, and adapt educational experiences to suit all learning objectives. While mobile technology can positively impact the pupils' lives and provide educational opportunities for the students, its adverse effects also need to be remembered. This study presents the impact of mobile technology on students' learning achievement in tertiary education. In this report, based on the literature review, mobile technology's positive and negative effects on education outcomes are also discussed. This study aims to understand mobile technology's role in the academic world and identify mobile technology's role in transforming learning and the impact of mobile technology students' achievement and motivation. The research also focused on the negative and positive effects of mobile technology on higher education and tried to examine whether mobile technology also affects students ' overall performance or not. It is crucial to understand how mobile technologies affect students' academic performance from their perspective. Work out its influences on their overall success to determine the effectiveness of implementing mobile learning in higher education and develop practical approaches for its adoption in higher education institutions. So, this study's objective is to understand mobile technology's role in the academic world and identify mobile technology's role in transforming learning and the impact of mobile technology students' achievement and motivation. All aspects related to mobile learning are examined in this research. Online Survey questions are designed for primary data collection, and peer-reviewed research articles are used as secondary data collection. TAM model is used to understand the relationship between dependent and independent variables and identify the related hypothesis. To obtain the information needed to answer the study questions, a statistically significant survey is used.

With the help of Qualtrics online survey tool, 26 survey questions were created, and an online link is shared by social media platform to collect the participants' responses. Total 210 valid responses is collected and after data gathering, data is analyzed by data analysis method.

According to the data analysis of this study, mobile technology has positive impact on student's motivation. Majority of a student use mobile technology to their learning activities daily. According to participants, m-learning support all their learning needs. Mobile devices are convenient for them to interact with tutors and useful to complete assessment and evaluation. Based on the findings of the study, it has been found that using mobile devices increases students' motivation. This immediately suggests that there is a significant relationship between the use of mobile devices in higher education and the motivation of pupils to study.

***Keywords*: E-learning, hypothesis, mobile technology, M-learning, motivation, tertiary education, TAM.**

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1. Introduction

Investments in Information technology have been made the highest priorities for educational institutions over the last few decades. (Witte & Rogge , 2014). Since the early 2000s, teachers and educators have been increasingly interested in using technology via face-to-face and online instructions for educational courses (Chen, Zou, Cheng, & Xie, 2020). Mobile learning has also arisen as a new technical achievement and educational trend that offers many options to both instructors and students. Mobile apps are considered one of six innovations that could advance education (Muasaad & Capretz, 2015). The potential for successful teaching and learning is improving with the usage of mobile technology (Ilci, 2014). This is because of the advantages of mobile learning, which include the ability to exchange information without regard to geographic or time constraints, as well as the potential to encourage analytical thinking, willingness to learn, problem-solving skills, and the formation of everlasting interpersonal skills (Tho & Abidin, 2018). Mobile technology offers an opportunity to use these technological innovations to address the emerging needs and requirements of tertiary education students. According to (Harfoushi, 2017) the number of mobile users grew to 1.7 billion in 2017, and 90 percent of the world population was within a mobile phone tower's coverage.

1.1 Aim and objectives

It is crucial to understand how mobile technologies affect students' academic performance from their perspective and work out its influences on their overall success to determine the effectiveness of implementing mobile learning in higher education and developing practical approaches for its adoption in higher education institutions. So, this study's objective is to understand mobile technology's role in the academic world and identify mobile technology's role in transforming learning and the impact of mobile technology students' achievement and motivation. In addition, the research also focused on the negative and positive effects of mobile technology on higher education and examined whether mobile technology also affects students ' overall performance or not.

1.2 Problem statement

Most researchers (Mlotshwa & Giannakopoulos, 2016) have sought the negative and positive effects of using mobile technology in primary, secondary, and presecondary levels. Still, the role of mobile technology in tertiary education is a more controversial issue. There is a need to understand why mobile technology is crucial for classrooms and the different perspectives for using mobile technology in higher education. Numerous articles reviewed and found the minimal but positive effects of mobile technology on student achievements, but there is no specific information about mobile technology used by educators and students and their experience while using mobile technology (Heflin, Shewmaker, & Nguyen, 2017). In addition, there is a need to investigate the attitudes of educators and students towards the use of mobile technology in higher education, which helps to understand whether they are ready to use mobile technology in the academic world or not.

1.3 Timeline and cost

In this research, an online survey is conducted to gather the participant's responses, so there is no financial cost included in this survey. This study's planned schedule was challenging because there are only four weeks to take a survey from the wider society. The timeline to complete this research project is given in figure 1.

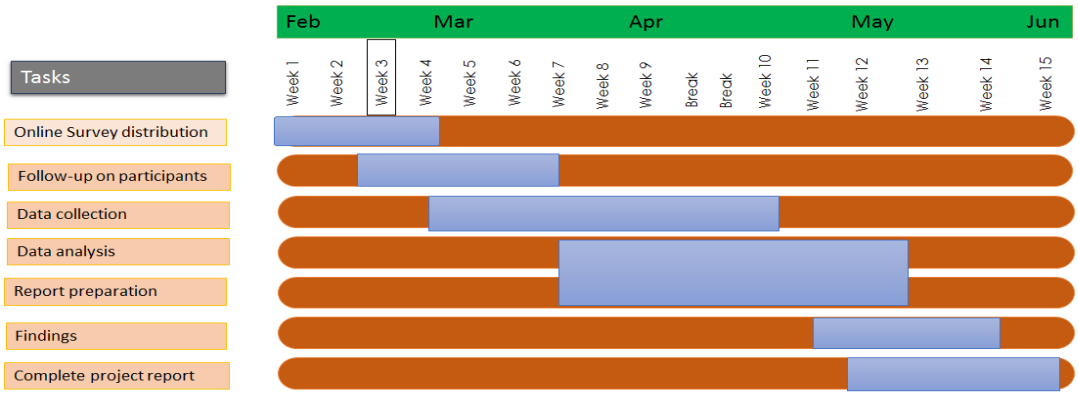

Figure 1. Timeline and cost

1.4 Report structure

The report outlines the various research questions and survey activities that were conducted and the study's analysis to find alternative approaches. This report is divided into different sections and chapters. In chapter 1 is the Introduction. In Chapter 2 review of related research of M-learning has been discussed. Chapter 3, the methodology which is used in this research is defined. It details research questions, hypotheses, theoretical framework, research approach, data gathering, and data analysis. In chapter 4, results of data collection is given. Chapter 5 included a discussion that gives detailed information about the result gathered, data analysis, and sampling method. In chapter 6, the conclusion of the research report is defined. At the end of chapter 7, references are given.

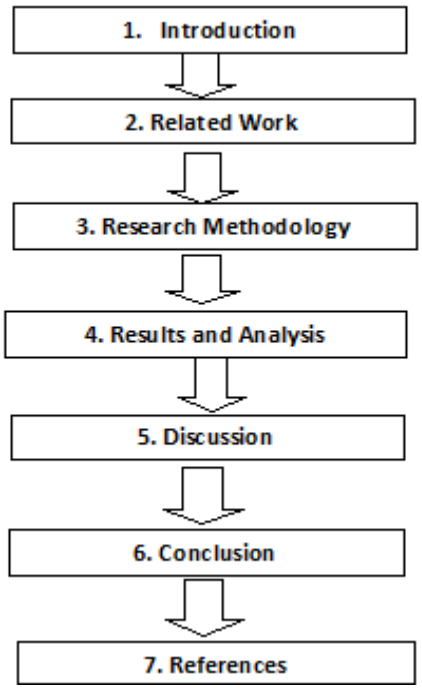

Figure2. Report structure

2. Related work

Academic institutions that want to thrive must continue to explore ways of being better than their counterparts in today's highly competitive environment (Hamidi & Jahanshaheefard, 2019). Mobile devices may be used to supply students with new resources, such as learning that is structured, customized, and not obstructed by contextual or environmental constraints (Crompton, Burke, & Gregory, 2017). Smartphones are becoming increasingly common among students, establishing a new era of collaboration, communication, and learning (Shonola S. A., Joy, Oyelere, & Suhonen, 2016). The various forms of education, their benefits and drawbacks, and how mobile technology has become a necessity for students worldwide in this modern age is described in this section. The review of literature is divided into different sections and sub-sections. The literature map constructed for this literature review is given in figure3.

Figure3. Literature map

2.1 Type of learning in tertiary education

The tertiary education sector has become more and more technology-driven (Ahmad, 2020). Since the advent of personal computers, learning has been developing(Hamidi & Chavoshi, 2018). Different forms of learning are described as following.

2.1.1 Traditional approach of education

In the context of learning, teachers generally assume that teacher-centered learning is more efficient. The educator becomes the primary controller in the classroom, and pupils are only the listener and remain passive throughout the lecture (Mapesos, 2017). Traditional learning is also referred to as face-to-face learning. It provides students with course work and details, and the students depend exclusively on the teacher to acquire the necessary information(Balaji, Al-Mahri, & Malathi, 2016). Previous research has shown that certain disadvantages for students who follow conventional learning generally refer to the education process (Khalaf, 2018).

2.1.2 Distance learning

Distance education offers educational opportunities for pupils who cannot attend traditional courses because of jobs, marital status, family commitments, distance, and conventional education expenses (Hannay & Newvine, 2006). However, it also has some drawbacks, despite the benefits of distance learning. For instance, success may rely on technology as some people may have some experience or technical difficulties with technology, which is an obstacle to learning (Almarashdeh, 2016). Furthermore, according to (Andronic, et al., 2012), distance learning can include innovative tools used besides or alone. Therefore, it is essential to select the most effective strategies that best help achieve the defined objective.

2.1.3 E-learning

Due to the advancement of technology in distance learning, it turns into e-learning. Nowadays, online learning is the largest growing tertiary education sector, gaining popularity on and off-campus (Markova, Glazkova, & Zaborova, 2017). According to (Hamidi & Chavoshi, 2018), the idea of e-learning was founded in the late early nineties, which provides the pupil with a medium for efficient interaction with the teacher and accessibility to the massive ocean of information available online. Across most circumstances, E-Learning corresponds to an entirely

online course, curriculum, or certification. Distance learning, computerized electronic learning, online learning, internet learning, and many more words are used to describe learning that is given online, via the internet (Al-Atabi & Al-Noori, 2020). For many learners, education is becoming a part of living, and it has shown to be a viable technique of learning. The notion that e-learning is student-centered is its most appealing characteristic. It conforms to individual interests and requirements. At the same time, it gives students from all walks of life fair access to the best tools and referral materials, as well as lectures, mentoring, and veteran professionals (Wani, 2013). The definition of e-learning in tertiary education is to establish a learning environment in which students can progress. Students who use e-learning create an atmosphere where students can explore, modify, and investigate. According to the (Arkorful & Abaidoo, 2014), e-learning is defined as the use of technological tools in a variety of educational processes to support and enhance learning in higher education, and contains the use of ICT as a supplement to traditional classrooms, online education, or a combination of the two methods.

2.1.3.1 Positive impact of E-learning

Positive effects and benefits associated with the adoption of e-learning technology into education have been offered by many research and scholars (Abbad & Morris, 2009). According to certain studies (Borstorff & Lowe, 2007), one of the benefits of e-learning is its capacity to focus on the requirements of individual students. For example, through the usage of discussion boards, it is able to give possibilities for learners to form relationships. By doing so, e-learning helps to remove barriers to involvement, such as the fear of speaking with other students (Kyari, et al., 2018).

In the conventional teaching process, the advancement of digital and information technology and the Internet as a modern learning strategy have made fundamental changes (Arkorful & Abaidoo, 2015). According to (Srivastava, 2018), E-learning has made teachers make a tremendous amount of effort to assist students in obtaining multimedia-filled interactive features because it has been shown to have a significant impact on students ' learning. As a result, E-learning has become a blessing for many students (Arkorful & Abaidoo, 2015). It provides many benefits, including not only limited to a single place or time, but also enables students to access a vast amount of knowledge in a shorter period, the opportunity to interact

easily with teachers, and modules customized to meet each student's needs and enable them to further their education (Pavel, Fruth, & Neacsu, 2015).

2.1.3.2 Negative impact of E-learning

While e-learning has many benefits, it also has a few drawbacks, including a lack of face-to-face engagement with peers and teachers (Mohammadyari & Singh, 2015). Despite claims that e-Learning may increase educational outcomes, scholars believe in making learning materials available online only improves learning outcomes for certain types of collective evaluations (Chang, Hajiyev, & Su, 2017). In addition, not all subjects or specializations can benefit from the use of e-learning in education. E-learning, for example, cannot adequately study primarily scientific areas that involve practical applications. According to studies, e-learning is more effective in the humanities and social sciences than in fields like medicine and medicine, where practical skills are required (Gunawardana, 2005). Less efficient in clarifying doubts and ineffective in transmitting information between classmates, ineffective in conducting examinations and projects, and not appropriate for specific areas such as medical studies and pharmaceutical (Chang, Hajiyev, & Su, 2017).

2.1.4 Blended learning

Blended learning is a creative technique that incorporates conventional classroom teaching and technology-supported learning benefits, including offline and online learning (Lalima & Dangwal, 2017). According to (Zhonggen, 2015) blended learning is gaining increasing popularity among tertiary pupils and lecturers by integrating the Internet with classroom learning. Researchers have found that Blended Learning enhances student success and achievement and boosts students' sense of connection compared with face-to-face classes (Dziuban, Graham, Moskal, Norberg, & Sicilia, 2018). In addition, blended learning approaches have accelerated the need for school administrators, staff, learners, and the surrounding community to take advantage of those resources provided by enhanced personalization, collaboration, and communication enabled by its technologies (Development Victorian Department of Education and Early Childhood, 2012).

2.1.5 Mobile technology in learning

Mobile technologies are described as small enough digital devices to fit in a pocket, including smartphones, portable digital assistants (PDAs), and iPod (Kaliisa & Picard , 2017). Mobile devices have changed from a medium of interaction to platforms for socialization, amusement, employment, and learning with mobile technologies' development and their growing affordability (Pollara, 2011). The use of certain devices in the classroom fosters a deeper relationship between the teacher and the student, improves their engagement, and leads to more collaborative and interactive learning (Adeboye, 2016). As a result, mobile devices are technological tools meet the specific needs of any user, especially the need to increase education and knowledge acquisition (Ahmad, 2020).

2.2 Impact of mobile technology

According to (Soyemi, S.A., & Okafor, 2015), motivation, portability, and collaboration are the factors that impact the learning process of mobile technologies. Therefore, there are both positive and negative impacts of mobile technology advancement on tertiary education (Suhail, 2019).

2.2.1 Positive impact of mobile technology

The mobile has made students' lives easier by accessing their academic data on the device through electronic learning and mobile learning (Darko-Adjei, 2019). A study has revealed that the ability to allow users to learn anywhere and at any time is one of the advantages of smartphones, making studying more exciting (Jung, 2014). Mobile technology facilitates students' academic activities in many ways, such as uploading learning resources, recording live lectures, downloading class materials at a suitable time, engaging with research study, and completing projects (Ifeanyi & Chukwuere, 2018). According to (Park, Nam, & Cha, 2012), pupils in the modern period are generally positive about using smart phones for learning. These gadgets have been proven to give students the capacity to direct their own learning and go from a formal to an informal educational environment while remembering up to the optimum rate (Cascio & Montealegre, 2016).

2.2.2 Negative impact of mobile technology

The research found out (Suhail, 2019) that students in tertiary education institutions in developing countries quickly move with technological advances. Due to mobile phones and spending a significant portion of their quality time in non-academic activities such as using WhatsApp, Twitter, Instagram, message on the Facebook notification and chatting and taking selfies to share on social media to update status (Ando & Morimoto, 2009). There are concerns that mobile technologies' functions may interrupt learning or be harmful (Mueller, Wood, Pasquale, & Cruikshank, 2012). Due to its limited screen size, the research revealed that students could not use a mobile as a learning tool compared to a laptop that offers a more comprehensive screen, small keyboard and acts as a distracting factor during classroom lectures (Sarfoah, 2017).

2.3 Factor that impacts mobile technology in education

Adopting mobile technology as a learning tool in higher education is essential for the decision-maker (Ahmad, 2020). A study showed that pupils who use mobile technologies in learning have great motivation than those who do not use (Shonola A. , Joy, Oyelere, & Suhonen, 2016). The effectiveness of mobile technologies has been the objective of several recent research projects, and most of them have shown the positive effect of this technology on education. A finding (Sarfoah, 2017) shows that insecure or inadequate internet access is a critical factor that prohibits learners from using smartphones as a learning tool, whereas 72 % of respondents affirmatively replied to this statement. According to (Valk, T. Rashid, & Elder, 2010), mobiles should also influence educational outcomes by transforming the role of learning and teaching, as the essence of mobile technology accumulates with modern education and encourages it. Personalized, learner-centered, situated, interactive, universal, and lifelong learning are new (Baby, 2019). Mobile technology is also increasingly personal, user-centric, mobile, networked, omnipresent, and resilient (Cheon, Lee, Crooks, & Song, 2012).

2.4 Impact of mobile technology on students' motivation

M-learning allows users to obtain information in a reliable manner, which was before unachievable (Crescente & Lee, 2011). This benefit of accessibility is unrestricted by time or

location. Compared to desktop computers or laptops, the equipment required for mobile connectivity is comparatively affordable, resulting in cheaper education expenses and making it accessible to those who could not afford it (Kaliisa & Picard , 2017). Every process of learning requires the availability of motivation. It plays a crucial influence in changing the learner's behavioral patterns and is essential for second language acquisition accomplishment. Mobile devices have become an integral part of their daily lives. Using mobile apps in the classroom can boost student motivation (Baby, 2019). According to (Ciampa, 2014) before deploying any learning programs, it is vital to critically analyze the range of innovative learning activities on dimensions of motivation. Many studies have found a correlation between mobile devices and student motivation and proved that mobile learning significantly impacts their motivation (Navaridas, Santiago, & Tourón, 2013). Motivation is a fundamental requirement for student participation in any student learning; motivation may impact what and how well students learn (Alzaza & Yaakub , 2011). Motivation is essential in motivating students to use mobile devices for learning. Many students are motivated and enthusiastic about using mobile devices; nevertheless, little is understood what makes studying smartphones so engaging and motivating (Chou, Block, & Jesness, 2012). According to (Mockus, et al., 2011)research, over half of respondents said that content delivered on their mobile devices motivates them to learn was the most significant finding of this m - learning investigation.

2.5 Impact of mobile technology in class interaction

Although mobile technology motivates and engages students in the learning process, it also provides "portability," allowing students to access materials and connect with instructors and classmates from anywhere. Some critics believe that students are not engaged in the classroom because of mobile technology (Mohammadi, Sarvestani, & Nouroozi, 2020). According to (Hwang, Lai, & Wang , 2015), mobile technology is being used in behavioral and academic activities. However, teachers have great difficulty understanding and discovering ways to use technology in their classroom assessment processes. According to (Klimova, 2019), almost 95% of students believe that utilizing mobile devices allows them to connect with teachers and peers more rapidly.

On the other hand, other students highlight the benefits of having all of their course materials in one tiny device (Adeboye, 2016). Learners may do well on smart gadgets at first but drop out when they cannot comprehend the course material. Teachers have difficulty understanding and discovering ways to use technology in their classroom assessment processes (Mohamed, Shaari, Ismail, & Yusoff, 2018).

2.6 Future of mobile technology in higher education

Using smartphones is, by all indications, a widespread practice in the educational world. In developing countries, teachers, lecturers, and academic institutions gradually adopt mobile technology to engage students, teachers, and others to provide them with education (Ali & Arshad , 2016). The amount of interest and spending in technology for learning and teaching by educational institutions is evidence of a bright future ahead (Chukwuere & Masiu, 2018). However, mobile phones will look completely different in the future from those of today; tertiary education also must prepare to provide education to meet the expectations of new young students (Ally & Prieto-Blázquez, 2014). The following mobile technology age will also be interactive, with digital input and output functionality.

2.7 Conclusion

In the above literature review section, peer-reviewed article findings and contributions are discussed. Related work helps to find out problem statements and gives in-depth knowledge to understand the topic. The various forms of learning, their benefits and drawbacks, and how mobile technology has become necessary for students worldwide in this modern age described in this section, which provides information about how learning methods have been changing for the last two decades. The positive and negative impacts of mobile learning revealed the benefits and limitations of adopting m-learning in the future.

3. Research methodology

According to (Igwenagu, 2016) a consistent approach for solving an issue is known as the research methodology. It is a technique used to analyze how research should be conducted. Research methodology is primarily the techniques by which academics get around their business of identifying, understanding, and forecasting facts. on the other way. It is the study of strategies for gaining knowledge. Therefore, it can also be defined as the study of techniques for gaining knowledge.

All aspects related to mobile learning are examined in this research. Online Survey questions are designed for primary data collection, and peer-reviewed research articles are used as secondary data collection. In this chapter, research design, research questions, and sub-research questions are defined.

3.1 Research design

The structure for finding answers to the research questions is known as research design. The research design defines the type and sub-type of the studies such as experimental, review, meta-analytic, correlation, descriptive, research questions, semi-experimental, hypothesis, dependent and independent variables, data collection, and statistical plan if applicable (Akhtar, 2016). This quantitative research method is used to conduct the research. In this, a quantitative research question rephrases a specific topic to verify scientific data to verify with the hypothesis and characterize the correlations between variables (Creswell, Research design: Qualitative, quantitative, and mixed methods approaches, 2009). In this research project, three processes are used to improve the understanding of the research. Firstly, understand the research question and then collect by participants through the survey questions, finally using this data to find the research questions.

The aims of conducting this research are presented in this section, and the hypotheses and research questions are set out. An overview of the theoretical framework and how the variables are related to each hypothesis is described.

3.2 Research questions

The main motive of this study is to understand the impact of mobile technology on tertiary education. The research is divided into the main research question and multiple research questions related to its scope to fulfill this purpose. Further sub-research questions are part of the leading research questions, which provide details to figure out the results of the leading research topic.

3.2.1 Main Research Question

MRQ. What are the impacts of students' use of mobile technology on their learning achievements in tertiary education?

Sub research questions

SRQ1. Does the use of mobile technology influence the motivation of students?

SRQ2. Does the use of mobile technology influence the interaction of students with the teachers?

SRQ3. What are the positive impacts of using mobile technology on student achievements?

SRQ4. What are the negative impacts of using mobile technology on student achievements?

The main research question aims to examine the effect of mobile technology on students' achievements in tertiary education. The first sub-question is helping to examine mobile technology's influences on the motivation of the students. The second sub-question helps to understand the effect of using mobile technology on student and teacher interaction. The third sub-question is helpful to figure out the positive impact of mobile technology, and the fourth sub-question is examined the adverse effects of using mobile technology on students' achievements in tertiary education

3.3 Hypothesis and theoretical framework

The technology acceptance model will be used in this research. It is the most widely used theoretical framework use for these kinds of research. With excellent measurements (Chen, Fan, & Farn, 2007; Paul, 2003), TAM provides accurate resources and has been justified

rationally and theoretically. The Technology Acceptance Model (TAM) developed by Devis focuses on variables influencing users' satisfaction in using technology. The TAM and its variants are intended to explain the fundamental factors affecting the acceptance of systems, such as LMS, by technology(Al-Emran, Mezhuyev, & Kamaludin, 2018; Davis et al., 1989; Viswanath, 2000). TAM is used to conceptualize two main factors, such as Perceived Usefulness (PU) and Perceived Ease of Use (PEU), to evaluate an individual's behavioral intention of users. PU is explained as the extent of the user's belief to improve his work engagement by using a unique IS, and EOU is described as the degree of confidence of a user's effortlessness while using an IS. The Technology Acceptance Model (TAM) is selected depending on this background and the framework concepts to help direct the research. The proposed research TAM model of this research is given below to understand the relationship between dependent and independent variables and identify the related hypothesis. The TAM model is used to understand the relation between free variables such as Age(A), Gender(G), Experience of mobile devices(E), Digital Literacy(DL), Willingness to Use(WU) with the Subordinate variables Perceived Usefulness (PU) and Perceived Ese of Use(EOU). And how they are correlated to Behavioral Intention(BI)to use mobile technology and Actual Use(AU).

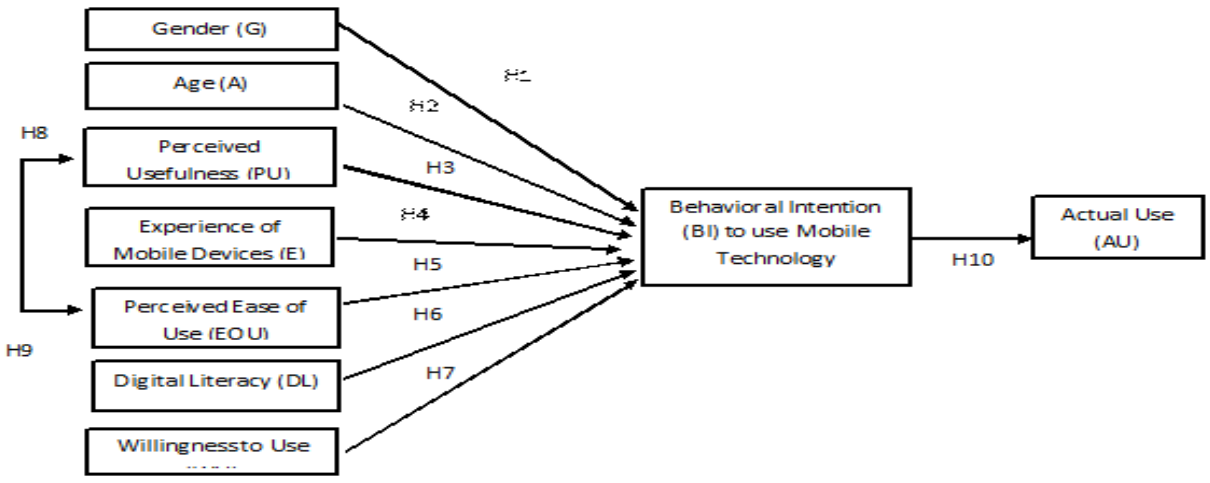

Figure4. Proposed TAM model

H1: Gender has a significant impact on behavioral intention to use mobile learning.

H2: Age has a significant impact on behavioral intention to use mobile learning.

H3: Perceived Usefulness has a significant impact on behavioral intention to use mobile learning.

H4: Experience of mobile devices has a significant impact on behavioral intention to use mobile learning.

H5: Perceived Ease of use has a significant impact on behavioral intention to use mobile learning.

H6: Digital literacy has a significant impact on behavioral intention to use mobile learning.

H7: Willingness to use has a significant impact on behavioral intention to use mobile learning.

H8: Perceived Ease of use has a significant impact on Perceived Usefulness.

H9: Perceived Usefulness has a significant impact on Perceived Ease of Use.

H10: Behavioral Intention to use mobile learning has a positive impact on Actual Use.

Hypothesis 1(H1) represents the relationship between gender and the behavioral intention of using mobile technology. It determined that particular gender significantly impacts people's behavioral choice to use m-learning in higher education. Hypothesis 2 (H2) expresses the relationship between age and behavioral intention, which shows that mobile technology has influenced the motivation of particular age groups. It is identified in the survey. Hypothesis 3 (H3) represents the association between perceived usefulness and behavioral intention. The behavioral intention to use information technology is a predictor of the behavioral motivation to use it (Aditia, Tela, Saleh, Ilona, & Zaitul, 2018). H3 shows that they perceive the use of mobile technology has a positive impact on the behavioral motivation of students. It also has a significant effect on student and teacher interaction.

Hypothesis 4 (H4) expresses the experience of using technology is positively related to the behavioral intention of using mobile learning. It shows the experience of using technology will

help to understand whether m-learning has a positive or negative impact. Hypothesis 5 (H5) represents the relationship between perceived ease of use and behavioral intention of mobile technology. H5 predicts that ease of use of mobile technology has a significant impact on student and teacher interaction. Hypothesis 6 (H6) defines the association between digital literacy and behavioral intention of mobile technology. It forecasts digital literacy towards technology has a positive impact on student achievements. Hypothesis 7 (H7) determines that willingness to use technology is positively related to the behavioral intention of using mobile technology. It helps to predict willingness to use mobile technology has a positive or negative impact on student motivation. Hypothesis 8 (H8) expresses that perceived ease of use is positively related to perceived usefulness. It shows that ease of using mobile technology has a positive impact on student achievement. It is identified in the survey. Hypothesis 9 (H9) simplifies that perceived usefulness has a positive effect on perceived ease of use. It predicts the perceived effectiveness of mobile technology has a positive impact on student achievements and influences the students' motivation. Hypothesis 10 represents the relationship between behavioral intention and the actual use of mobile technology. It forecasts the negative and positive impact of the actual use of mobile technology in higher education.

3.4 Hypotheses and sub research question

The relationship between sub-research questions with the hypothesis is given, showing how hypotheses connect with sub-research questions.

Sub Research Questions	Hypotheses
SRQ1	H1, H2, H3, H7, H8
SRQ2	H3, H5
SRQ3	H4, H6, H7, H9, H10
SRQ4	H4, H6, H7, H10

Table1. Linking between hypotheses and sub research questions

In this table 1, the link between hypotheses and sub-research questions is presented. On the right-hand side, there are hypotheses, and on the left-hand side, sub-research questions are shown in the table.

3.5 Research tool

A survey questionnaire is the most effective way to obtain valuable information due to the lack of time and funds available for conducting the research. Therefore, a cross-sectional online poll is performed for four weeks to gather the responses to the above study questions. With the help of Qualtrics online survey tool, 26 survey questions were created, and an online link is shared by social media platform to collect the participants' responses. After data gathering, data is analyzed by the data analysis method.

With the help of the TAM model, hypotheses and variables are created to explore the topic in detail.

3.6 Research approach

Research approaches are research strategies and techniques covering everything from general assumptions to detailed data collecting, analyzing, and evaluation methodologies (Creswell & Creswell, 2017). The three most common research approaches are quantitative, qualitative, and mixed-method. Every research approach is different from one another according to its structure and design. According to research approaches are the procedure like building the architecture of a house (Leavy, 2017). The choice of research approaches should be according to the research problem being addressed. According to this research, the quantitative research approach is the best suit for analyzing the data.

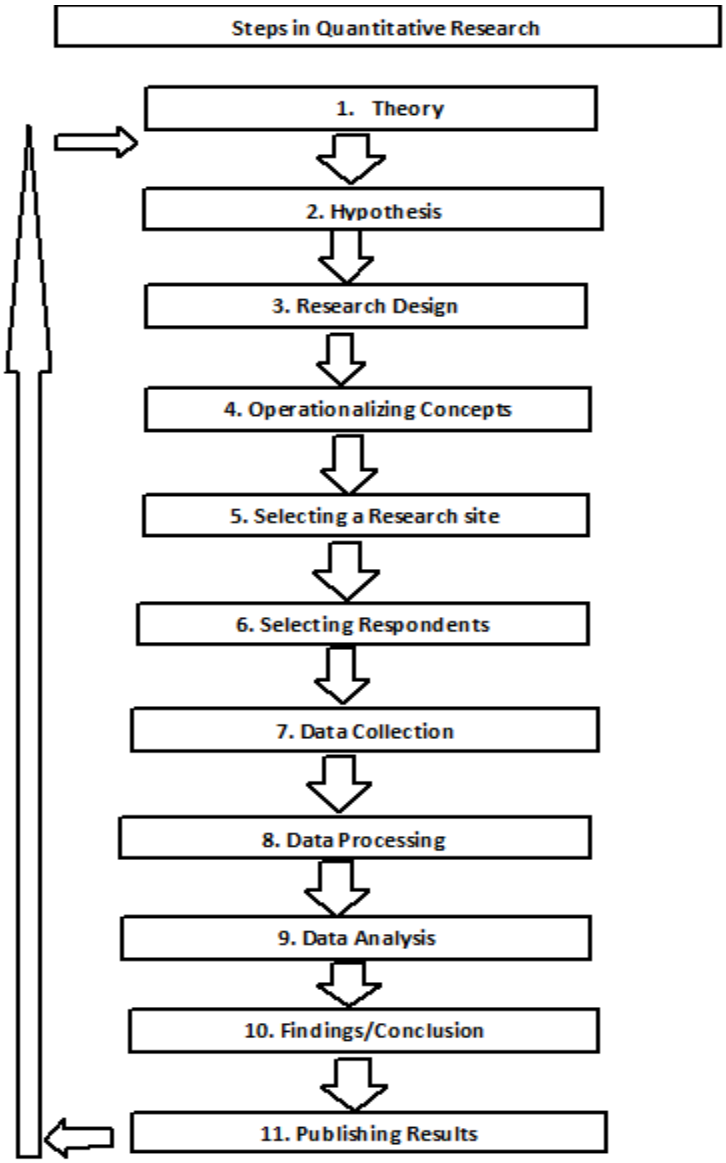

Figure5. Research approach (Williams, 2007)

In the above figure 5 step by step procedure is given to follow the research approach.

3.7 Sampling

The goal of sampling is to accumulate expense and workload that is likely to be needed to survey the entire target population (Marshall, 1996). The collection of information from a group of individuals is linked to a survey. In this case, survey sampling describes how to coordinate a survey by gathering a sample of variables from the targeted population.

3.8 Target population

The cumulative New Zealand-based target population to conduct this research is 4 million sixteen thousand students (Education Counts, 2020) over 18 and have used mobile technology while pursuing higher education.

3.9 Sampling method

Convenience sampling is a representation of a form of non-probability sampling that is used to carry out this analysis.

3.10 Sampling unit

A student over the age of 18 and has used any form of mobile technology while pursuing higher education is the sampling unit of this research.

3.11 Sampling size

Diversity of the population, the amount of acceptable error, and the confidence interval are the three variables required to assess the sample size. According to (Education Counts, 2020), in 2019, in formal higher education, including international and domestic students, a total of 388730 enrolments were registered. Therefore, the sample size of 599 was estimated using the sample size calculator available on https:/www.surveysystem.com/, with a population size of 388730, a confidence interval of 4, and a confidence level of 95 percent.

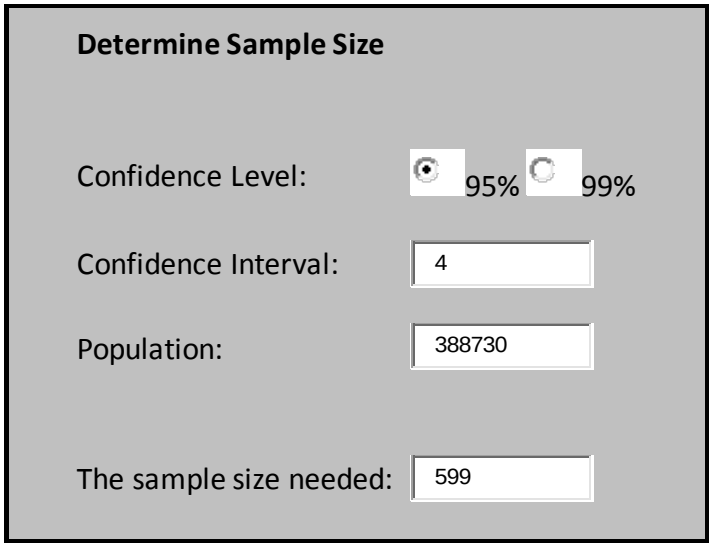

Figure6. Sample size estimation for the survey (Creative Research Systems, n.d.)

3.12 Data gathering

Using an online questionnaire, the data is collected in this study. Facebook, WhatsApp, and others social media platform is used as a medium to deliver the online questionnaire for this survey to the participants. After getting approval from the ethics committee, an online link https://wintec.au1.qualtrics.com/jfe/form/SV_dmSAJxlrrwQowni is generated for four weeks. Throughout that time, the students were able to use this link and answer the questions online.

3.13 Data analysis

To obtain the information needed to answer the study questions, a statistically significant survey is used.

The table below shows the measurement type to be used in this survey. In addition, the linking between survey questions, research questions, and hypotheses also represented in this table.

Survey question no	**Hypotheses**	**Research questions**	**Measurement type**
S1	H2	MRQ	Nominal
S2	H2	MRQ	Ordinal
S3	H1	MRQ	Nominal
S4	H1, H2	MRQ, SRQ1	Nominal
S5	H4, H5, H6, H7	MRQ	Nominal
S6	H4. H5, H7	MRQ, SRQ1	Ordinal
S7	H7, H8, H10	MRQ, SRQ1	Nominal
S8	H4, H8, H9, H10	SRQ1, SRQ3	Ordinal
S9	H6, H7	SRQ1, SRQ3, SRQ4	Ordinal
S10	H7, H9, H10	SRQ3, SRQ4	Nominal
S11	H3, H8, H9	SRQ1, SRQ3	Nominal
S12	H4, H5, H6	SRQ2	Nominal
S13	H3. H8, H9	SRQ1, SRQ3	Ordinal
S14	H8, H9, H10	SRQ1, SRQ3	Nominal

S15	H3, H5, H9	SRQ3, SRQ4	Nominal
S16	H3, H5, H9	SRQ1, SRQ3	Ordinal
S17	H4, H6	SRQ4	Ordinal
S18	H3, H5, H10	SRQ1, SRQ3	Ordinal
S19	H3, H8, H9	SRQ1, SRQ3	Nominal
S20	H8, H9, H10	SRQ3	Nominal
S21	H5, H7, H8, H9	SRQ1, SRQ3	Nominal
S22	H4, H6, H10	SRQ4	Nominal
S23	H4, H10	SRQ3	Nominal
S24	H4, H7, H8, H9	SRQ1, SRQ3	Ordinal
S25	H4, H10	SRQ4	Nominal
S26	H4, H7, H10	SRQ1, SRQ3	Nominal

Table 2. Linking between measurement type, hypothesis, survey questions and research questions

4. Results and analyses

This chapter includes the results of a summarized descriptive analysis based on data from 210-responses to an online survey. The hypotheses were classified as supported based on the findings of this descriptive analysis. A researcher can use descriptive analysis to measure and characterize the basic properties of a data collection. As a result, the descriptive analysis serves as a foundation for statistical analysis, allowing the researcher to categorize, summarize, and capture data.

S1: Are you more than the age of 18?

The given pie chart shows the participants who took part in this survey.1st question is regarding the age of the student. People who are above age 18 are 95 % and below 18 are 5 %. In total, 220 responses, 210 participants' age is more than 18, and 10 people below age were not eligible to take this survey according to this study. Participants automatically exit the survey when they click on no option.

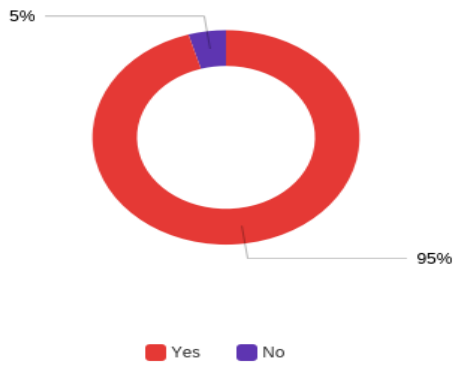

Figure7. Number of participants

In below table represents the valid responses in percentage. 95.45% people from the total number of participants are above 18, and 4.5% of people were below 18, so they automatically exit by clicking on no option. People above 18 are mature enough to participate, so the target population was above 18.

Age	Answer	Percentage	Participants

Above18	Yes	95.45%	210
Below 18	No	4.55%	10
	Total	100%	220

Table3. Participants above age 18

S2 : Participants' age group

This survey question is based on the first survey question related to the age of the participants. In this question, age groups are classified into six categories. People had to choose one option to select on which age group they belong. The vertical line shows the number of participants, and the horizontal line illustrates six different categories of age groups. For example, fig8 represents the information that people who belong to age group 27-30 were maximum in percentage and people who are over 50 age respond less.

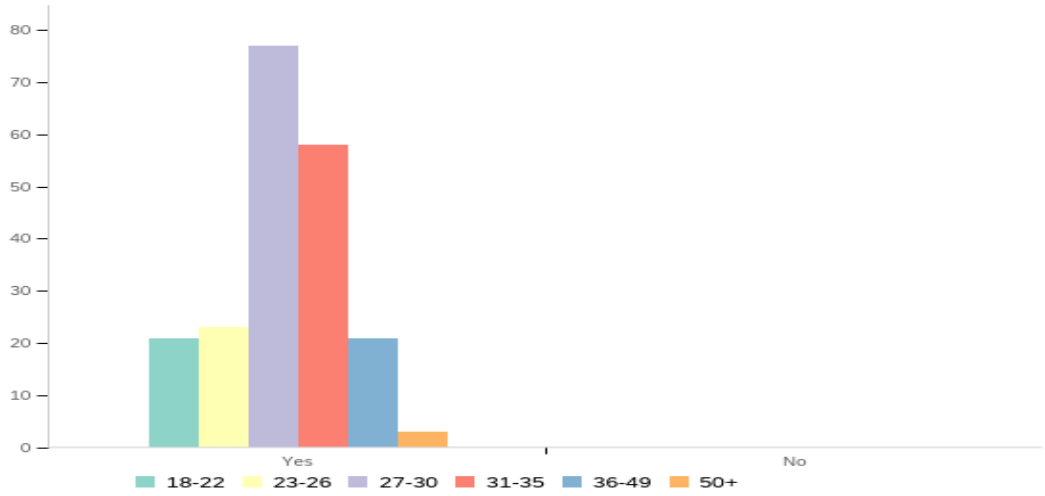

Figure 8. Participants' age group

Table first column represents the age group of participants. The second column defines the proportion of people according to age group. The third column expresses the numeric form of the participant. Seventy-seven people are from age group 27-30 in this survey that is more than another age group. However, people who belong to the age group of 31-35 are the second-highest who took part in this survey. Twenty-one participants belong to the age group of 18-22 and 36-49.

Age group	Percentage	Participants
18-22	10%	21
23-26	11%	23
27-30	38%	77
31-35	29%	58
36-49	10%	21
50+	1%	3
Total	100%	203

Table4. Participant' age group

S3: Participants' gender

Below, figure 9 shows the number of people who participated in this survey by gender. One hundred thirty males and 57 females took participate in this survey. Some people do not like to reveal their gender. They can choose to prefer not to say that was only 3%

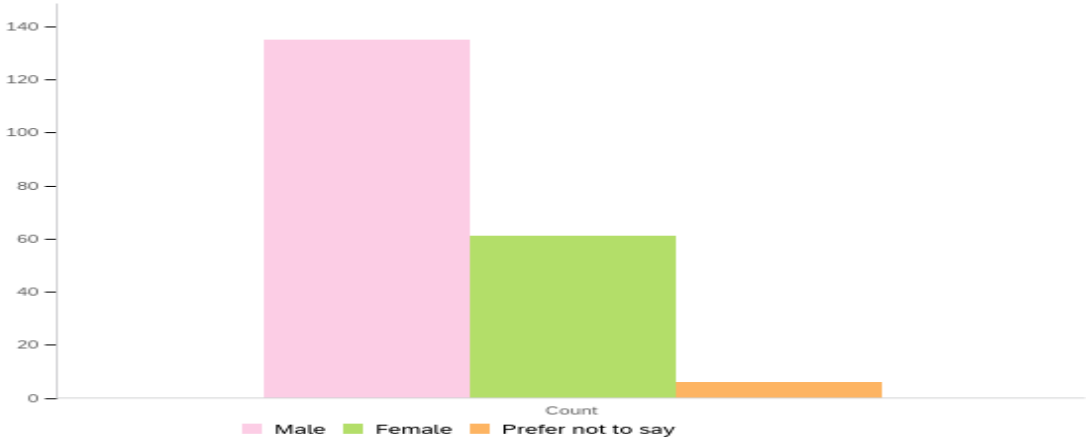

Figure9. Participant's gender

In table5, a total of 193 people gave to respond to this question. The proportion of male participants were 67% that is more than double of females participants.

Gender	Percentage	Participants
Male	67%	130
Female	30%	57
Prefer not to say	3%	6

Total	100%	193

Table5. Participants' gender

S4: Participants who completed or pursuing higher education

The figure10 illustrates the number of women and men who are pursuing or have completed their tertiary education. The vertical axis represents the number of participants, and the horizontal axis represents the gender of participants. The red bar shows the participants who studied higher education, and the blue bar shows those who did not study higher education.

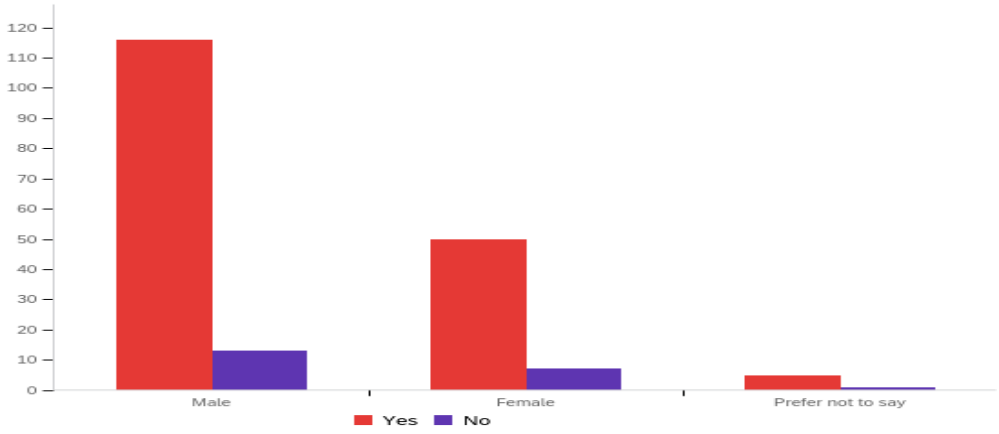

Figure10. Participants who completed or pursuing higher education by gender

Table6 below gives the information about participants' gender who have completed higher education. A total of 192 people answered this question. The total number of participants who completed higher education is 171 (116 male, 50 female, and five prefer not to say).

Gender	Male	Count	Female	Count	Prefer not to say	
Yes	89.92%	116	87.72%	50	83.33%	5
No	10.08%	13	12.28%	7	16.67%	1
Total	Total	129	Total	57	Total	6

Table6. Participants' who completed higher education by gender

S5: Participants' preferred device for academic work?

Below table7 shows different learning devices using by participants. Four different choices such as laptop, mobile, PC and tablet have given to take the responses. Percentage of participants

who used laptop and mobile while doing higher education is 45.96% . Very less percentage of participants preferred PC and tablet. Nearly 4 % of people using PC followed by tablet that is 3.73%

Learning Devices	Percentage	Participants
Laptop	45.96%	74
Mobile	45.96%	74
PC	4.35%	7
Tablet	3.73%	6
Total	100%	161

Table7. Different devices used by participants for academic purposes

In the given table8, there are four columns. In the first column, learning devices are given. Further, three columns are divided into two sub-sections. For instance, the male column is divided into percentages and participants. The total number of participants is given at the end. For example, 51% of male participants are using laptops. On the other hand, 35% of females used laptops. In the case of mobile, the proportion of females is more than males participants. For example, 24 females out of 48 used mobile devices while learning. However, 49 males out of 109 preferred mobiles.

Learning devices	Male		Female		Prefer not to say	
	%	Participants	%	Participants	%	Participants
Laptop	51%	56	35%	17	25%	1
Mobile	45%	49	50%	24	25%	1
PC	2%	2	8%	4	25%	1
Tablet	2%	2	6%	3	25%	1
Total	Total	109	Total	48	Total	4

Table8. Preferred devices for academic purpose used by participants by gender

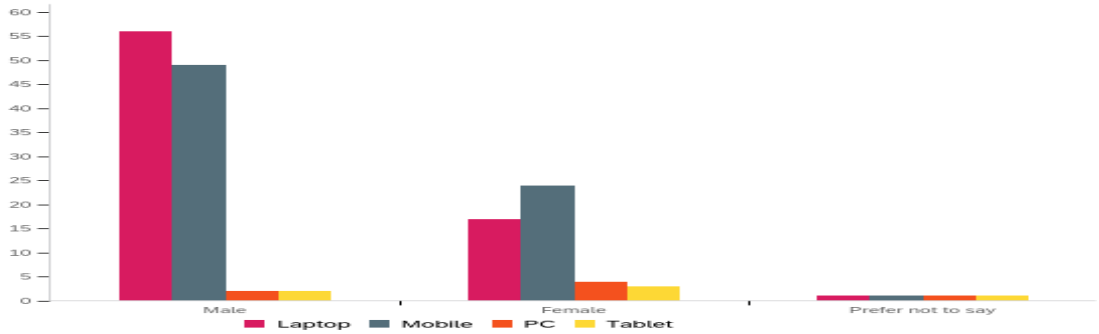

Figure11. Participants' preferred devices by gender

In the above bar chart figure 11, the horizontal line represents four different modes of learning devices by males and females, and the vertical line represents the number of participants. This is the graphical representation of table 8 given above.

S6: How long have you been using mobile phones to access your educational content?

In given pie chart figure 12 the highest number of respondents have been using mobile devices to access learning contents for more than 5 years. Participants who are using mobile devices for last 2 to 3 years to retrieve educational materials are 22% and who are using 4 to 5 years are 19%. Recorded data show that participants are much interested to use mobile devices to access their study related contents as they have been using mobile devices for more than 5 years to access their educational contents.

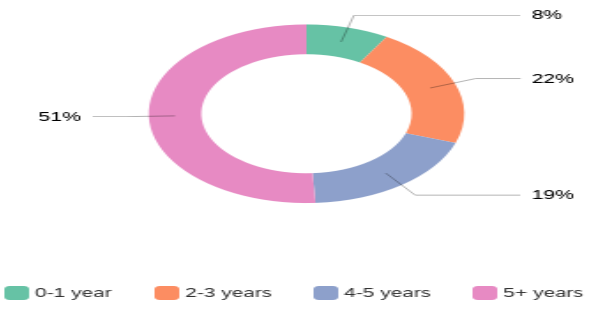

Figure12. Participants' responses about how long they are using mobile devices to access learning contents.

The below table 9 represents how long participants are using mobile devices to access their educational content. In the first column number of years is given. Most of the participants are

using mobile devices to access learning content for more than five years. For instance, 55% of male participants and 45 % of female participants are using mobile to retrieve learning materials.

	Male		Female		Prefer not to say	
Years	Percentage	Participants	Percentage	Participants	Percentage	Participants
0-1 year	10%	11	2%	1	50%	2
2-3 years	21%	23	24%	12	25%	1
4-5 years	14%	16	29%	14	25%	1
5+ years	55%	62	45%	22	0%	0
Total	Total	112	Total	49	Total	4

Table9. How long participants using mobile phones to access educational content by gender

S7: What is your frequency of using mobile phones in learning activities?

This question is asked to understand how frequently students are using mobile devices while studying. Frequent level is divided into "Always", "Sometimes" and "Never". Most of the participants are always use mobile devices in their learning activities according to their responses

Frequency level	Male	
	Percentage	Participants
Always	52%	57
Sometimes	46%	51
Never	2%	2
Total	100%	110

Table10. frequency to use mobile phones in learning by male participants

Above table 10 illustrates how frequently male participants using mobile in their learning activities. 52% of participants always use mobile devices, 46% of participants sometimes use mobile devices, and 2 % never use mobile while learning. Total male participants were 110 in which 57 male participants always used mobile devices in educational purpose.

Below is a graphical representation of how often male participants using mobile devices in learning.

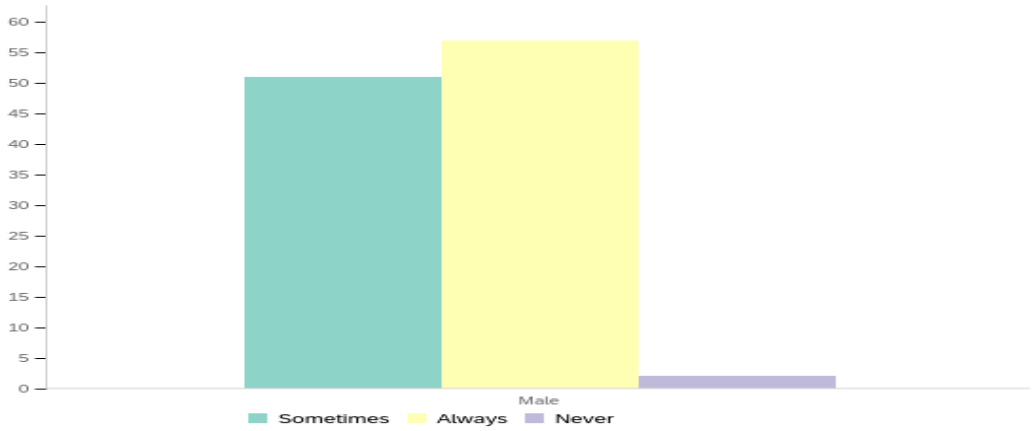

Figure13. Male participants' frequency to use mobile in learning

Below, table 13 shows frequency of using mobile while learning by females' participants. Out of 48 females, 23 females sometimes and 25 females always use mobile in learning.

	Female	
Frequency level	Percentage	Participants
Always	52%	25
Sometimes	48%	23
Total	100%	48

Table11. Frequency to use mobile phones in learning by female participants

S8: Satisfaction level of participants' using mobile phones while accessing learning materials.

This survey question asked to understand how satisfied students are with mobile devices to access study related resources. Recorded data shows that most of the participants are satisfied with mobile technology while accessing learning materials. For example, 81 males out of 112 that is equivalent to 72%, are satisfied using mobile devices to access educational resources. Similarly, 81 % of females, 38 out of 47, are satisfied with mobile devices while accessing learning materials. Given table 12 describes the satisfaction level of using mobile devices to retrieve learning contents by male and female participants. In the first column, the satisfaction level is divided into six different categories. There are three columns male, female and prefer not to say that are further divided into two separate columns percentage and participants.

Satisfaction Level	Male		Female		Prefer not to say	
	%	Participants	%	Participants	%	Participants
Satisfied	72%	81	81%	38	75%	3

Extremely satisfied	16%	18	13%	6	0%	0
Neither	7%	8	4%	2	0%	0
Dissatisfied	4%	4	2%	1	25%	1
Extremely Dissatisfied	1%	1	0%	0	0%	0
Total	100%	112	100%	47	100%	4

Table12. Satisfaction level of using mobile devices in learning by gender

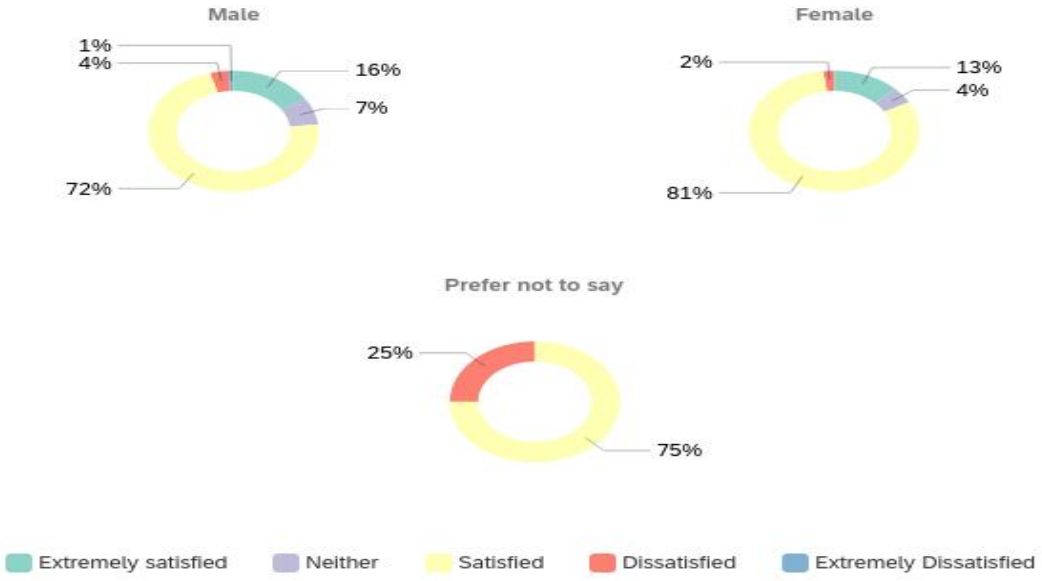

Figure14. Satisfaction level of participants using mobile technology in learning by gender

In this pie chart figure 13, different categories of satisfaction level given. Exceptionally few participants choose dissatisfied and extremely dissatisfied. In males, it is only 1 %, and in females, only 2% of participants are disappointed, which shows students are satisfied with using mobile devices in learning activities.

S9: Do you think mobile devices useful to access learning materials?

In below figure 14, 106 participants chose mobile devices to be helpful to access learning materials, and 38 participants believe that this is a beneficial device to access learning materials. Conversely, only 5 participants chose those mobile devices that are useless for accessing learning materials.

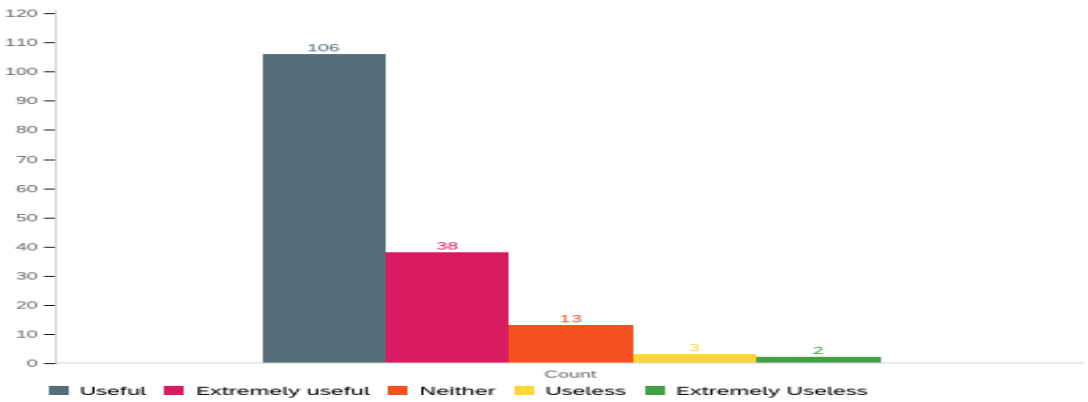

Figure15. Usefulness of mobile devices in learning materials

Table 13 below shows information about participants' response about how useful mobile devices is to access study related materials according to their age group. According to data in table all age group people chose mobile devices are useful or extremely useful while 2 participants chose it is useless or extremely useless for accessing learning materials. Mostly participants who belong to age groups 27 -30 and 31-35 selected mobile devices are useful or extremely useful in approaching study related things. In total 103 participants out of 157 are selected mobile devices are useful in accessing learning resources which shows that all age groups of people are more convenient and found mobiles are useful devices to approach learning materials.

	18-22	23-26		27-30		31-35		36-49		50+		Total
Usefulness	%		%		%		%		%		%		
Extremely useful	8%	3	18%	7	32%	12	37%	14	3%	1	3%	1	38
Useful	4%	4	11%	11	38%	39	34%	35	13%	13	1%	1	103
Neither	0%	0	17%	2	42%	5	25%	3	17%	2	0%	0	12
Useless	0%	0	0%	0	50%	1	50%	1	0%	0	0%	0	2
Extremely Useless	0%	0	0%	0	50%	1	0%	0	50%	1	0%	0	2

Table13. How useful of mobile devices for accessing learning materials by different age group

The below table 14 shows the convenient level of male participants using mobile devices for accessing learning resources. Most of the participants, i.e., 64% of male participants, are in favor of this, and only 2% of male participants selected it as useless.

Usefulness	Male	Participants
Extremely useful	23%	26

Useful	64%	71
Neither	10%	11
Useless	2%	2
Extremely Useless	1%	1
Total	100%	111

Table14. Convenient level of male participants of using mobile devices to access learning materials

In this table, 15 suitable levels of the female are given. Most of the females that is 70% chose mobile devices are helpful to access study related resources, and only 2% of female participants chose extremely useless.

Convenient level	Female	Participants
Extremely Useless	2%	1
Neither	2%	1
Useful	70%	33
Extremely useful	26%	12
Total	100%	47

Table15 Convenient level of female participants of using mobile devices to access learning materials

S10: How long do you use mobile devices on average to access learning materials in a day? (on average)

Given table 16 illustrates the frequency of using mobile to access learning contents in a day by participants. 40% of participants chose they are using mobile 4 to 7 hours in a day to find study materials and 62 out of 163 people are using mobile up to 3 hours. Data showed that most of the people spend usually 6 to 7 hours daily in mobile technology while accessing study related resources which shows their willingness to use mobile technology and how comfortable they are using mobile while finding contents related to study.

Hours of using mobile in learning activities	Percentage	Respondents
0-3 hours	38%	62
4-7 hours	40%	66
8-11 hours	9%	15
12-15 hours	3%	5
More than 15 hours	9%	15
Total	100%	163

Table16. Frequency of using a mobile device for learning in a day

The bar graph in figure 15 shows how many hours participants use the mobile device for accessing study contents according to their gender. The vertical axis represents the number of participants, and the horizontal axis represents the number of respondents by gender. Hours are represented by different colors bar. The data shows that most male participants use mobile for 4 to 7 hours a day to access learning materials. However, females use 0 to 3 hours. This graph represents that how much time people are spending in a day by different gender and found that male respondents are highest as compared to female who are using mobile technology to retrieve learning resources. However, everyday people are using mobile in their learning activities.

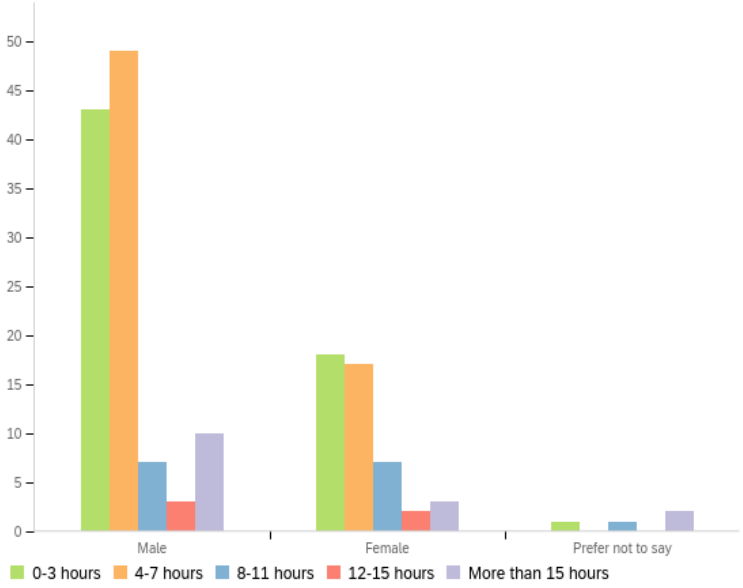

Figure16. Mobile devices in learning activities used by participants in a day by gender

S11: Do you believe mobile technologies support your learning needs?

The below table depicts how many participants believe mobile technologies support their learning needs. Recorded information represents that 137 out of 160 participants believe mobile technologies are supportive of their learning needs. However, only five respondents disagree on this. This survey question result shows that majority of participants believed that mobile technology is helpful for their learning requirements.

Choice	Percentage	Participants
Yes	86%	137

No	3%	5
Maybe	11%	18
Total	100%	160

Table17. Participants who believe mobile technology support their learning needs

The majority of participants who believe mobile technologies support their educational needs are in the age group of 27-30 and 31-35. For instance, 46 participants from both age groups agreed on this.

Age Group	Yes		No		Maybe		Total
	%	Participants	%	Participants	%	Participants	
18-22	100%	9	0%	0	0%	0	9
23-26	86%	18	10%	2	5%	1	21
27-30	79%	46	2%	1	19%	11	58
31-35	87%	46	4%	2	9%	5	53
36-49	94%	16	0%	0	6%	1	17
50+	100%	2	0%	0	0%	0	2

Table18. Participants' belief on mobile technology to support their learning needs by different age group

In below table19 shows 83% of males and 92% of females believe mobile technologies are supportive in their learning activities. In contrast, 3% of males and 2% of females disagree on this.

Choice	Male		Female		Prefer not to say	
	%	Participants	%	Participants	%	Participants
Yes	83%	91	92%	44	67%	2
No	3%	3	2%	1	33%	1
Maybe	14%	15	6%	3	0%	0
Total	Total	109	Total	48	Total	3

Table19. Participants' belief on mobile technology to support their learning needs by gender

The bar graph in figure 16 illustrates the beliefs of male and female respondents on mobile technologies. The horizontal axis shows the number of participants, and the vertical axis shows the choices of male and female participants. For example, it can be seen in the graph that 91 females and 44 females believe in mobile technology, and three males and only one female disagree on this.

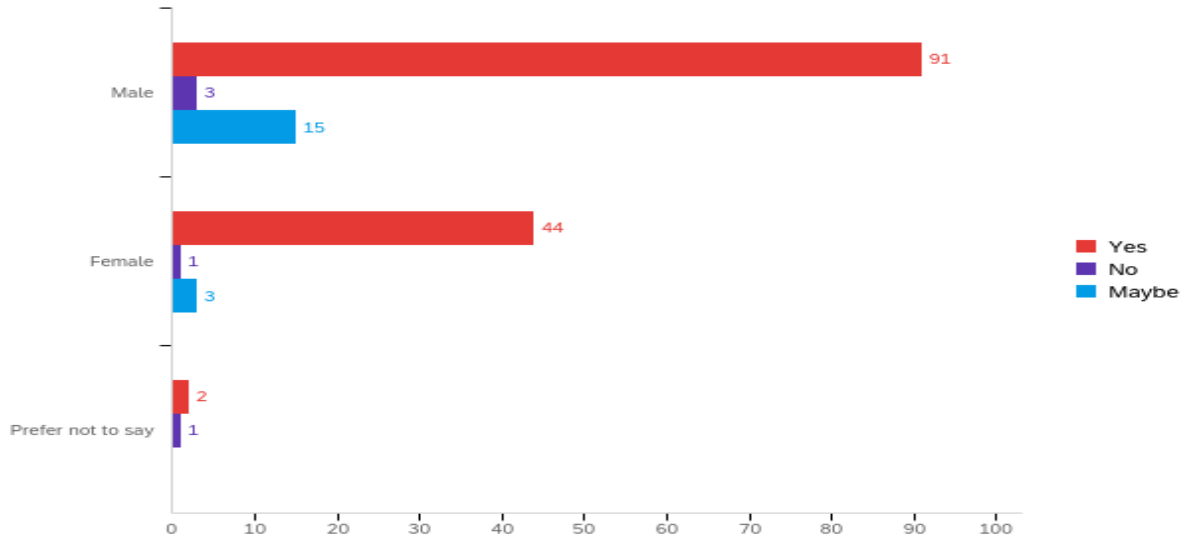

Figure17. Belief of participants on mobile learning by gender

S12: Does mobile technology helpful while communicating with your classmates and teachers?

This survey question is to understand whether mobile technology is a helpful mode of interaction between students and tutors. Respondents who are in favor of this is 88% that is 140 out of 160 responses. However, only 8% of participants disagree on this. According to recorded responses it can be seen that mobile technology is effective way to interaction between students and tutors.

Choice	Percentage	Participants
Yes	88%	140
No	5%	8
Maybe	8%	12
Total	100%	160

Table20. Participants belief in mobile technology as a mode of communication between teacher and students

The bar graph in figure 17 explains participants' belief in mobile technologies whether it is valuable to communicate between students and tutors. Forty-two females and 95 males respondents believe in this, while seven males and one female disagree.

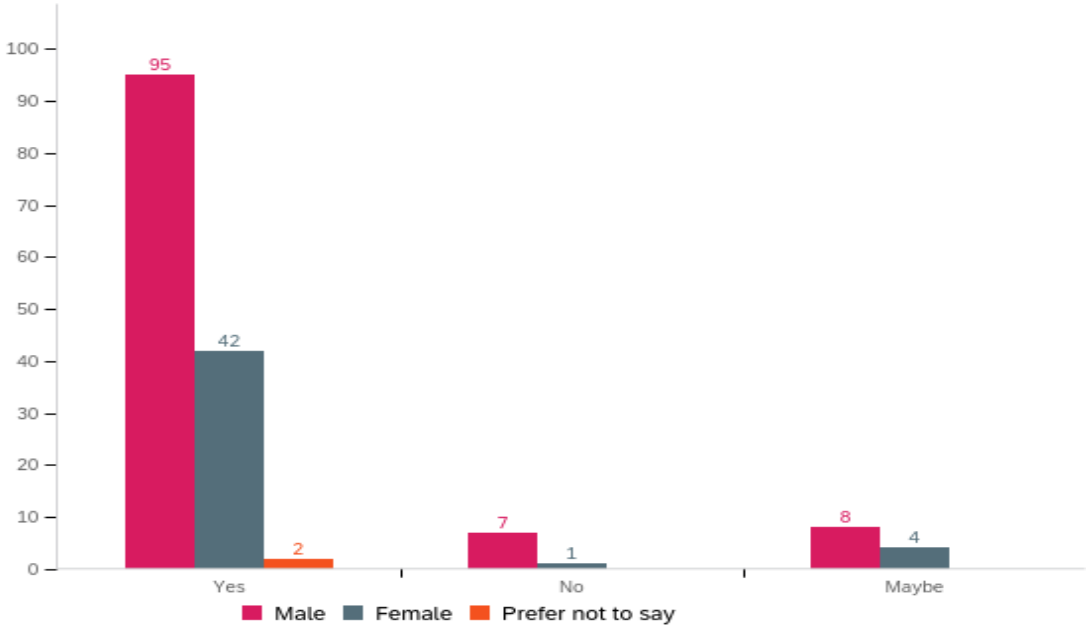

Figure18. Participants belief on mobile technology as a mode of interaction between tutor and students by gender

S13: Does mobile technology helpful in completing evaluations and assessments?

The majority of participants believe that mobile technology is valuable in completing assessments and evaluations. However, significantly fewer participants chose mobile technologies is useless in assessment and evaluation. For example, in below table 21, only 4 % of participants disagree on this. On the other hand, participants who chose mobile technologies are helpful is 65%. According to recorded data it has been seen that mobile technology is useful for completing assessments and evaluations.

Choice	Percentage	Participants
Extremely useful	17%	28
Useful	65%	106
Neither	13%	21
Useless	4%	7
Extremely useless	0%	0
Total	100%	162

Table21. How useful mobile technology for assessment purpose

Most of the data recorded in favor of helpful and extremely useful. In this graph, figure 18, it can be seen that male participants who chose mobile devices are valuable in assessment purpose is 67 and female participants are 36. Only seven male participants believe mobile technology is useless.

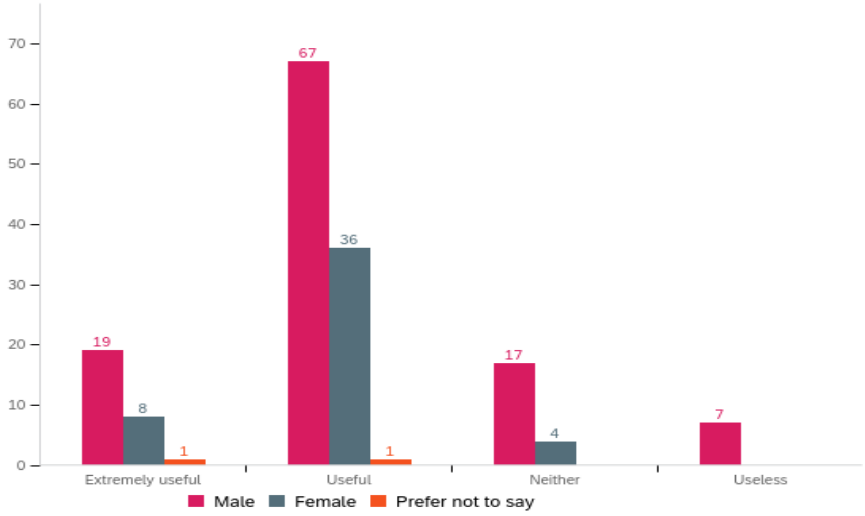

Figure19. How useful mobile technology for assessment purpose by gender

S14: Does mobile technology help in improving your academic outcomes?

Below, Table 22 depicts 77% of participants believe that mobile technology help in improving their educational outcomes. Whereas 7% of participants do not think on this, 16% of participants chose "Sometimes". Responses of this question proved that most of the participants considered mobile learning is assisting to improve their educational results and outcomes which motivates them to use mobile technology in learning activities.

Choice	Percentage	Participants
Yes	77%	124
Sometimes	16%	26
No	7%	11
Total	100%	161

Table22. Choice of participants believe m-learning improving their academic outcomes.

The data in below table 23 shows all the age groups of participants who believe mobile technology is helpful in academic outcomes. The highest ratio of participants who believe in this in the age group of 18-22,31-35,36-49 and more than 50 recorded 88.89%, 84.91%, 83.45%, 100%, respectively.

Age group	18-22		23-26		27-30		31-35		36-49		50+	
Yes	88.89%	8	80%	16	64.41%	38	84.91%	45	82.35%	14	100%	2
Sometimes	11.11%	1	10%	2	28.81%	17	7.55%	4	11.76%	2	0%	0

No	0.00%	0	10%	2	6.78%	4	7.55%	4	5.88%	1	0%	0
Total	Total	9	Total	20	Total	59	Total	53	Total	17	Total	2

Table23. Choice of participants believe m-learning improving their outcomes by different age group.

This pie chart in figure 18 shows the proportion of respondents by gender. Participants who chose the "Yes" option represents by red color and those who chose "No" represents by blue color. In terms of female participants, 87.72% are agreed, and 12.28 % disagree on this. On the other hand, 90.55% of male participants believe in mobile technology, and 9.45% disagree.

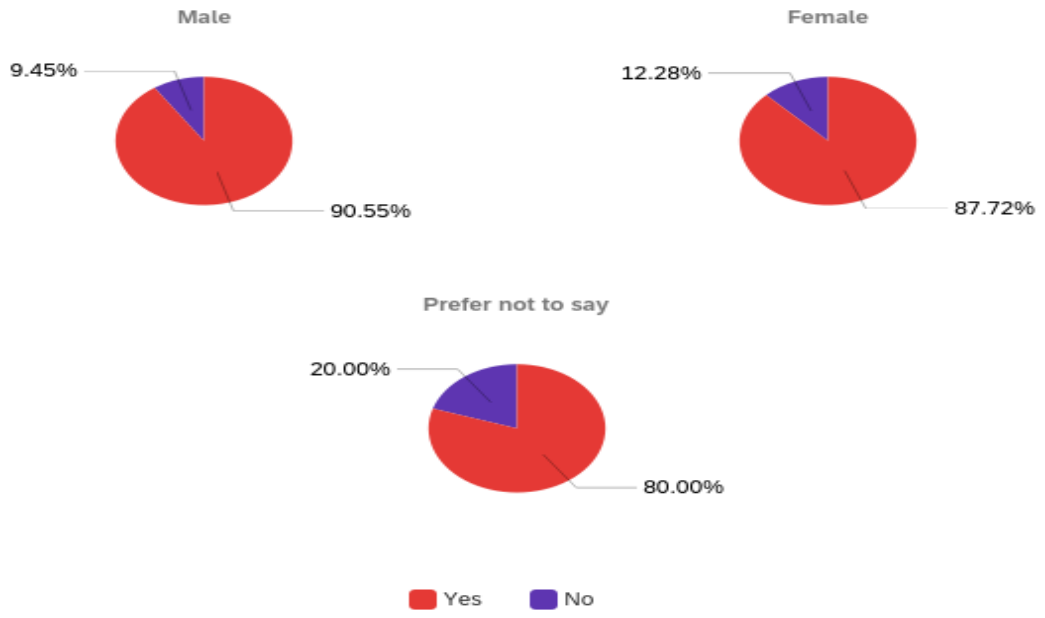

Figure20. Proportion of participants believe m-learning improving their outcomes by gender

S15: Does mobile learning help in gathering information and conducting research?

This research question is asked to understand how useful mobile learning is to conducting research and for gathering research information. In below table 24, recorded data shows that 78% of participants, 125 out of 161, believe mobile technology help in conduction research and gathering data. However, 5% of participants, 8 out of 161, disagree on this. According to recorded data, most of the respondents in the favor of mobile technology useful to access

Choice	Percentage	Participants
Yes	78%	125

Sometimes	17%	28
No	5%	8
Total	100%	161

Table24. Participants' who believe m-learning help in conduction research

In below figure 20 participants' choice by gender is given. In this, 75% male and 87% female believe in mobile technology use in research activities while 6% male and 2% females disagree.

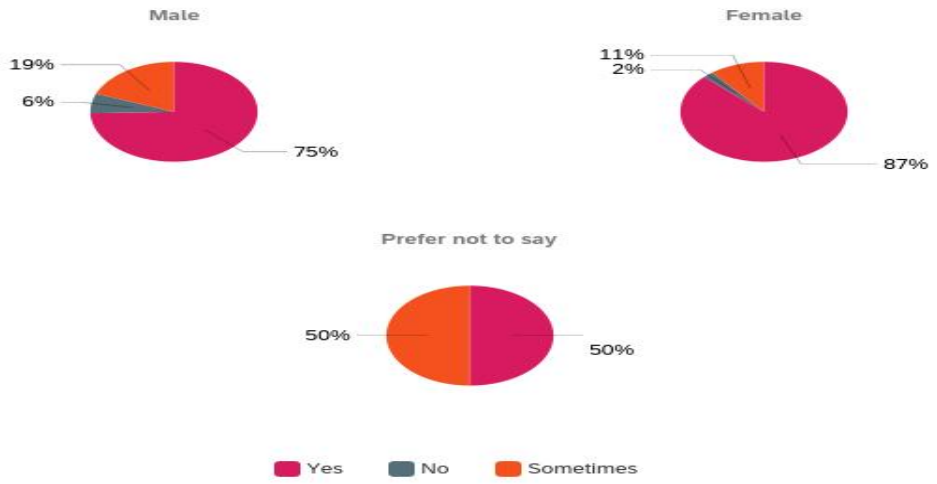

Figure21. Participants' choice by gender wo believe mobile technology help in conducting research

S16: What are the benefits offered by mobile learning?

This survey question is to figure out the benefits of using mobile learning. In table 25, most participants believe that using mobile technology and information can be easily accessible at any time. In addition, 29% of respondents believe it is a better mode of interaction. However, 3% of participants chose the "Not at all" option which means there are no benefits of mobile learning.

Benefits	Percentage	Participants
Accessibility of information anytime and anywhere	36%	59
Better communication with classmates and educators	29%	47
Economical as compared to other learning devices	6%	9

Improved cooperation among peers	5%	8
Not at All	3%	5
Others	3%	5
Portability of devices	12%	20
User-friendly	6%	10
Total	100%	163

Table25. Participants' choice about benefits of m-learning

In this table, 26 benefits of using mobile learning are given by participants' gender. The two most common benefits are better communication with classmates and accessibility of information anytime and anywhere are recorded in this survey. According to a male, 27% of participants believe mobile learning is the better mode of communication, and 35% chose "Accessibility of information anytime and anywhere." On the other hand, in the case of females, 33% chose "Better communication with classmates and educators," 40% chose "Accessibility of information anytime and anywhere."

	Male		Female		Prefer not to say	
	%	Participants	%	Participants	%	Participants
Better communication with classmates and educators	27%	30	33%	16	33%	1
Portability of devices	13%	14	13%	6	0%	0
Improved cooperation among peers	5%	6	4%	2	0%	0
User-friendly	6%	7	6%	3	0%	0
Economical as compared to other learning devices	6%	7	2%	1	33%	1
Accessibility of information anytime and anywhere	35%	39	40%	19	33%	1
Others	4%	5	0%	0	0%	0

Not at all	4%	4	2%	1	0%	0
Total	Total	112	Total	48	Total	3

Table26. Benefits of using mobile learning is given by participants' gender

S17: Challenges faced while using the mobile learning

This survey question asked to understand the challenges and problems students face while using mobile technology in learning. The data is presented by gender and by age group in the following tables and figures. According to the recorded data given in table 27, 35% of participants faced problem with short screen size. In addition, 19% of participants faced insufficient memory and storage problems, and 17% of participants chose low bandwidth and speed.

Challenges	Percentage	Participants
Distraction	15%	24
Insufficient memory and storage	19%	30
Low speed and bandwidth	17%	27
None of these	12%	18
Others	2%	3
Short screen size	35%	54
Total	100%	156

Table27. Challenges faced by using m-learning by participants

Table 28 represents data of male and female respondents who faced challenged while using mobile learning. First column represents challenges, and the following three columns are further divided into two sub columns. One column shows percentage second column shows participants. According to the recorded data, overall, 35% of participants faced problem by short screen size in which 34% of male and 36% of female faced problems with the short screen size of mobile.

	Male		Female		Prefer not to say	
Challenges	%	Participants	%	Participants	%	Participants
Short screen size	34%	36	36%	17	33%	1

Insufficient memory and storage	18%	19	23%	11	0%	0
Distraction	18%	19	9%	4	33%	1
Low speed and bandwidth	18%	19	17%	8	0%	0
Others	3%	3	0%	0	0%	0
None of these	9%	10	15%	7	33%	1
Total	100%	106	100%	47	100%	3

Table28. Problem faced by participants using mobile learning by gender

S18: How would you rate your achievement using mobile technology as a student?

The majority of respondents chose "Above average" in terms of the rate of achievement level using mobile technology. Table 30 illustrates 43% of participants chose above average, 32% chose average,18% chose brilliantly. Significantly fewer participants chose "Poor" in the given option.

Achievement level	Percentage	Participants
Brilliant	18%	28
Above Average	43%	68
Average	32%	50
Below Average	6%	9
Poor	2%	3
Total	100%	158

Table29. Rate of achievement by using mobile technology by different participants

The data in Table 32 represents the achievement level of males and females using mobile technology. In terms of males, most of the participants chose "Above average" and the "Average" proportion of 41% and 34% relatively. Similarly, 49% of females chose above average, and 26% chose the middle option in their achievement level.

	Male		Female		Prefer not to say	
Achievement level	%	Participants	%	Participants	%	Participants
Brilliant	17%	18	21%	10	0%	0
Above Average	41%	44	49%	23	33%	1
Average	34%	37	26%	12	33%	1
Below Average	6%	7	2%	1	33%	1
Poor	2%	2	2%	1	0%	0

Total	Total	108	Total	47	Total	3

Table30. Achievement level using mobile technology by participants' gender

The bar graph in figure 21 is about the rate of the achievement level of participants by gender. The verticals axis shows the number of participants, and the horizontal axis shows achievement level by gender. There are six different color bars representing achievement levels: Brilliant represented by a red bar, above average is by the blue, green bar is by Below average, etc. Overall, the majority of female and male participants rate their achievement level to "Above average."

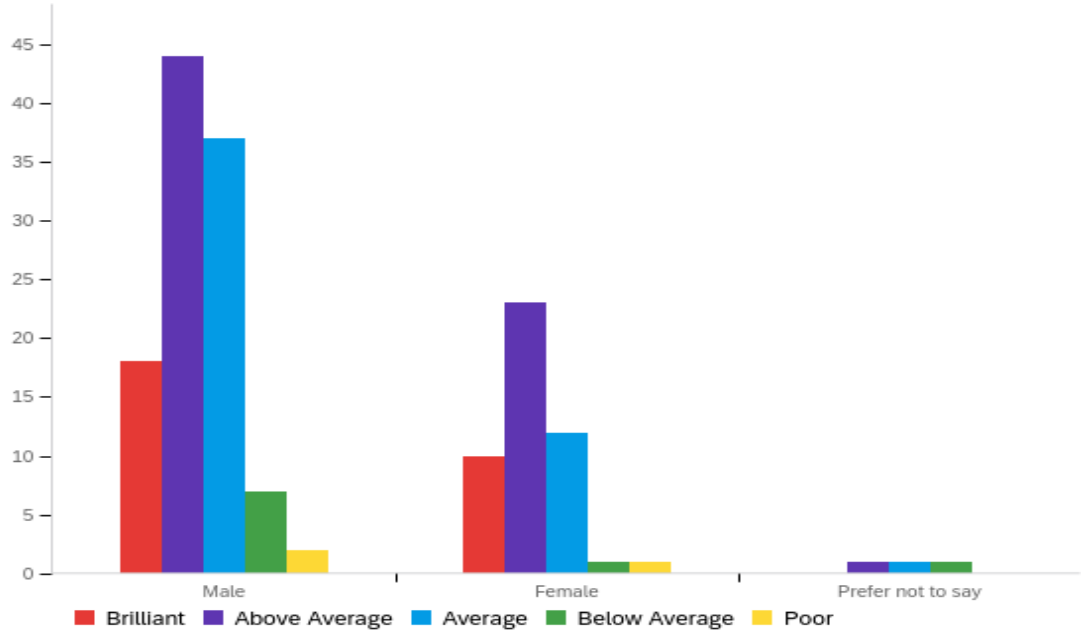

Figure22. Achievement level using mobile technology by gender

S19: Does mobile technology help to improve your academic performance?

This survey question asked to collect information regarding whether the student believes mobile technology helpful for improving academic performances. Recorded data in table 33 that the majority of respondents thought mobile technology is improving their academic outcomes. The table depicts 73% of participants, 116 out of 159, believe in mobile technology to enhance their educational performance.

Choice	Percentage	Participants
Yes	73%	116
Sometimes	21%	33

No	6%	10
Total	100%	159

Table31. Participants' choice regarding academic performance

In this table34, the percentage of participants by gender who responded to this survey question is given. 68% of males and 855 of females believe mobile technology helping to improve their educational performances. However, a minority of 6% of males and 4% of females do not agree.

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Yes	68%	74	85%	40	67%	2
Sometimes	26%	28	11%	5	0%	0
No	6%	7	4%	2	33%	1
Total	Total	109	Total	47	Total	3

Table 32. Participants' choice regarding academic performance by gender

Bar graphs in figure 22 provide information about several responses according to their gender. The vertical line shows the participants, and the horizontal line shows a different choice of male and female participants. It can be seen in the bar graph that the majority of participants believe that mobile technology benefits for educational outcomes.

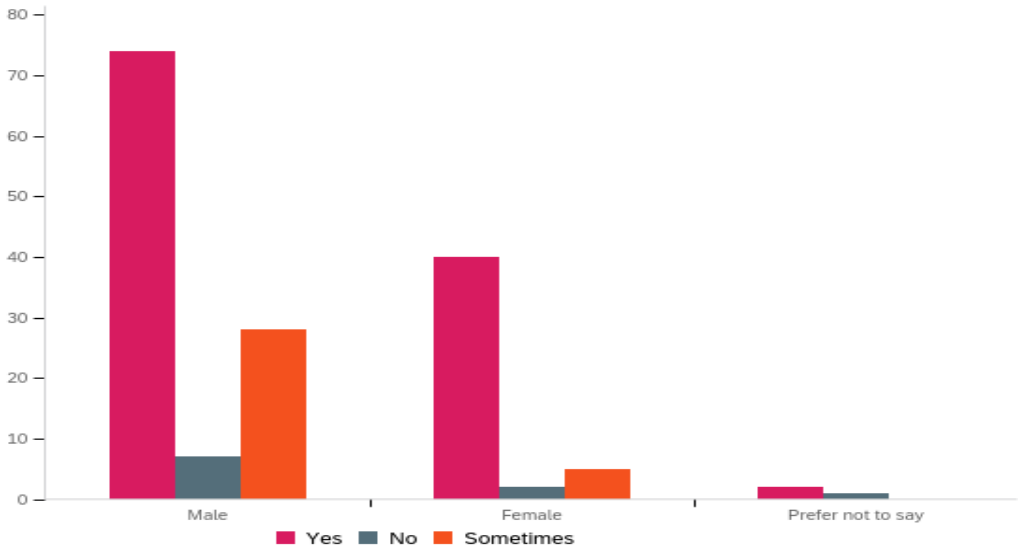

Figure23. Participants' choice regarding academic performance by gender

S 20: In comparison to other learning methods, is mobile technology relatively cheap?

This survey question is to get to know whether people believe mobile learning is cheaper than other learning methods or not. In table 35 below, it can be seen that the majority of

participants agreed that mobile education is more affordable than other learning methods. For instance, 63% of respondents, 100 out of 158, believe mobile learning is less expensive.

Choice	Percentage	Participants
Yes	63%	100
Maybe	23%	36
No	14%	22
Total	100%	158

Table33. Participants' choice about how cheap mobile learning is

Following gender, 67% of males and 56% of females believe mobile learning is relatively cheap. Only a few numbers of respondents do not agree on this. However, 21% of males and 27% of females are neither approved nor disagree on this.

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Yes	67%	72	56%	27	33%	1
Maybe	21%	22	27%	13	33%	1
No	12%	13	17%	8	33%	1
Total	Total	107	Total	48	Total	3

Table34. Participants' choice about how cheap mobile learning by gender

Below, the pie chart in figure 23 shows the proportion of male and female participants. For instance, 56% of females and 67% of males chose they agree that mobile learning is economic as compared other learning devices. On the other hand, 17% females and 12 % males disagree on this.

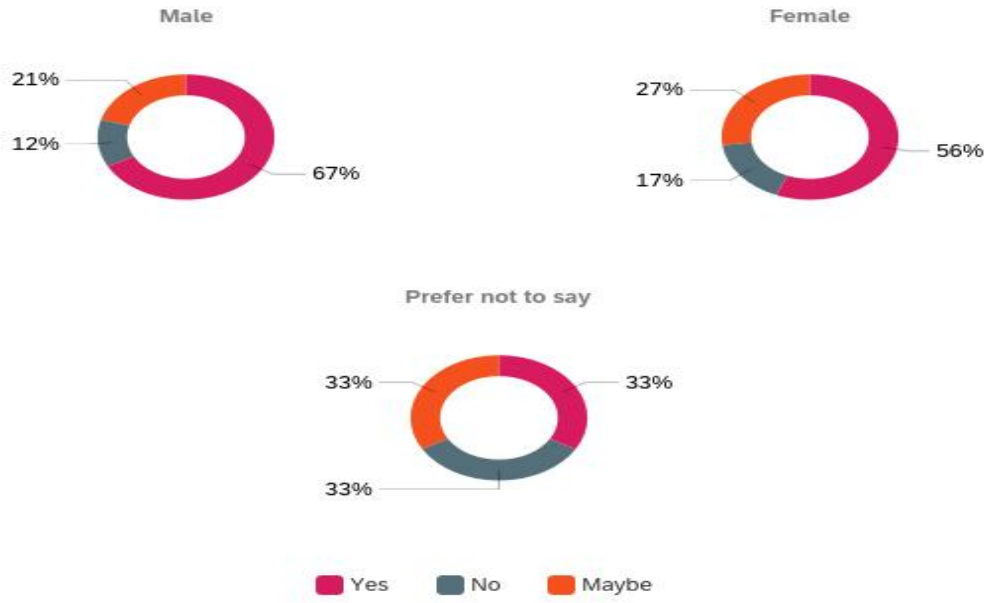

Figure24. Proportion of participants' choice by gender

S21: Is it more convenient to use M-learning in contrast to other learning methods?

The maximum number of participants believe that M-learning is better than other learning methods. The data from table 38 shows that 71% of respondents favor M-learning, and only 8% of respondents are not in the popularity of M-learning. However, 21% of respondents are neither agree or disagree on this.

Choice	Percentage	Participants
Yes	71%	112
Maybe	21%	33
No	8%	13
Total	100%	158

Table35. Participants' choice about how convenient to use m-learning as compared to other learning method

In given pie chart figure 24, data is presented by gender. 70% of males and 73% of females chose M- learning as a suitable method of learning compared to others. Only 20% of males and 4% of females do not consider mobile education is better than others.

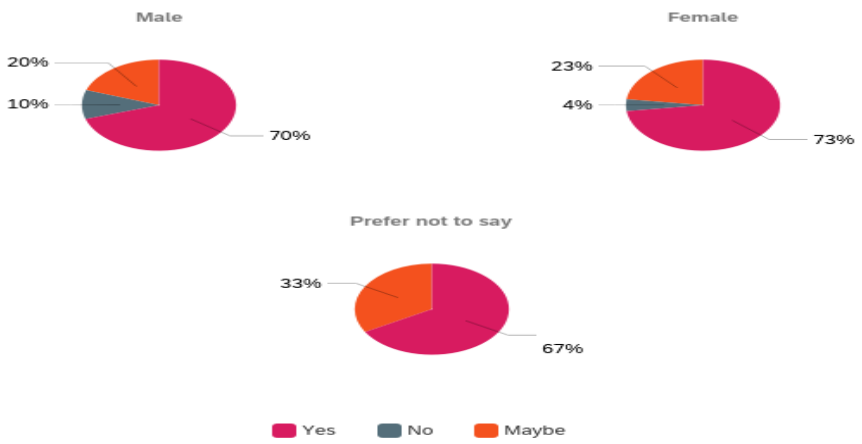

Figure25. Frequency of convenience level of participants by age group

S22: Do you think mobile devices can be harmful in class?

The table 40 illustrates that maximum number of respondents believe that mobile devices are harmful for them. 52% respondents that is 81 out of 157 said mobile devices are harmful. Very less respondents believed it is not harmful that is 27%. 22% of respondents are either agree or disagree on it.

Answer	Percentage	Participants
Yes	52%	81
Maybe	27%	42
No	22%	34
Total	100%	157

Table36. Participants' choice who belief mobile devices are harmful.

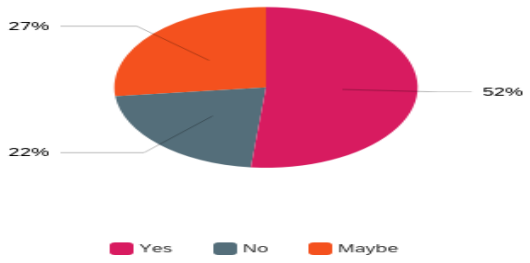

Figure26. Respondents who believe mobile technology is harmful

Above figure 25, shows proportion of respondents who believed that mobile technology is harmful in class. Overall, majority of respondents thought mobile devices are detrimental.

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Maybe	17%	18	50%	24	0%	0
Yes	58%	62	40%	19	0%	0
No	25%	26	10%	5	100%	3
Total	Total	106	Total	48	Total	3

Table37. Respondents who believe mobile devices are harmful by gender

In above table 41, in terms of male candidate 62 out of 106 respondents and in terms of females 19 out of 48 believe mobile devices are not worthwhile in class activities. 25% of male and 10% of females believe mobile devices is not harmful.

S23: Do you prefer mobile technology as a method of learning?

In this section, preference of using mobile technology were recorded by participants. 98 participants out of 157 preferred mobile technology which shows most of the participants gave preference to mobile technology.

Choice	Percentage	Participants
Yes	62%	98
No	23%	36
Maybe	15%	23
Total	100%	157

In this pie chart figure 26, 62% participant said they preferred mobile technology. 23% participants don't prefer mobile technology and 15% participants did not give any clarification about their preference.

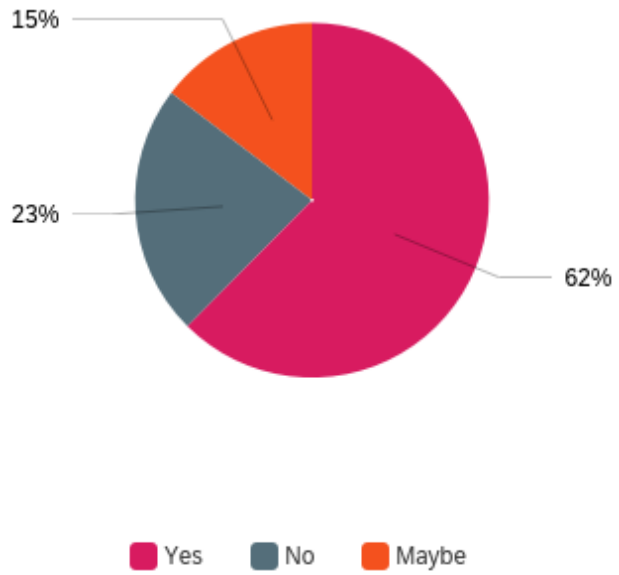

Figure27. Preference of participants about using mobile technology in learning

Below table 43 illustrates the recorded data by gender according to their preference of using mobile technology. Overall, the proportion of female participants who preferred mobile technology is highest that is 75%.

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Yes	57%	60	75%	36	67%	2
No	27%	29	13%	6	33%	1
Maybe	16%	17	13%	6	0%	0
Total	Total	106	Total	48	Total	3

Table39. Preference of participants using m-learning by gender

S24: Purposes of using mobile technology

This survey question is to collect the information about reasons and purposes of using mobile technology. In first column, purposed of using mobile technology is given. 45% of participants are using mobile technology for social media which is found the highest reason. The second highest reason is to use mobile technology is to finding study resources that is recorded 36%. Least number of participants using mobile technology for playing games that was recoded only 3 %.

Purposes	Percentage	Participants
To use social networking	45%	70
Finding study resources	36%	56
To check e-mail	11%	17
Others	5%	8
Playing games	3%	5
Total	100%	156

Table40. Purposes of using m-learning by participants

Participants have different purposes of using mobile technology according to their age group. Table 45 depicts that participants who are in the age group of 31 to 35 mostly use mobile technology for finding study resources. 27 to 30 age group participants mostly used mobile technology for operating social media sites.

	18-22		23-26		27-30		31-35		36-49		50+	
Options	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count
Others	0%	0	0%	0	9%	5	6%	3	0%	0	0%	0
Finding study resources	56%	5	53%	9	28%	16	42%	22	24%	4	0%	0
Playing games	0%	0	0%	0	5%	3	0%	0	0%	0	50%	1
To check e-mail	0%	0	6%	1	9%	5	12%	6	29%	5	0%	0
To use social networking	44%	4	41%	7	49%	28	40%	21	47%	8	50%	1
Total		9		17		57		52		17		2

Table41. Purposes of using mobile technology by age group

The data shows that 50% of male that is 53 out of 105 using mobile technology for social networking. On the other hand, females mostly used mobile technology for academic purposes that was recorded 48%, 23 out of 48.

The bar graph in figure 27 , horizontal line represents different purposes of using mobile technology by gender and vertical line represents number of participants. In this graphical

representation, it can be clearly seen that male are using mobile for social media and female for getting study material. No reason is recorded by female participants in the choice of "playing game".

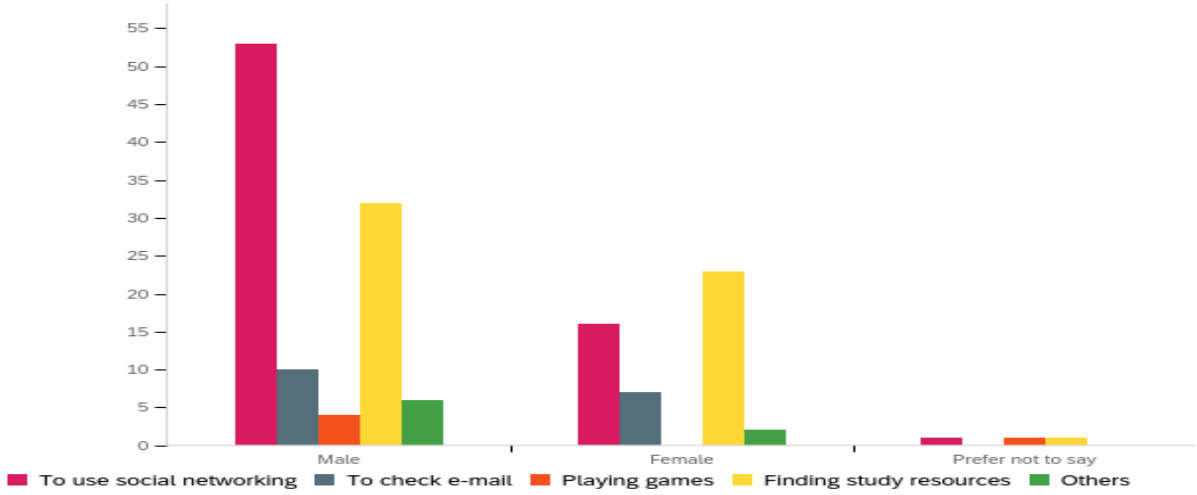

Figure28. Purposes of using mobile technology by gender

S25: Do you think you are addicted of mobile technology?

Choice	Percentage	Participants
Yes	36.71%	58
No	32.28%	51
Sometimes	31.01%	49
Total	100%	158

Table42. Participants' choice about addiction of mobile

The table 47 uses three different choices to show addiction of mobile technology by participants' gender. It can be seen there is a slightly difference between choice . Most of the participants agreed upon that they are addicted of mobile technology. For example, 36% male and 34% females and 3 participants who prefer not to say their gender chose they are addicted to mobile technology.

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Sometimes	31.48%	34	31.91%	15	0.00%	0
No	32.41%	35	34.04%	16	0.00%	0
Yes	36.11%	39	34.04%	16	100.00%	3
Total	Total	108	Total	47	Total	3

Table43. Participants' choice about addiction of mobile by gender

Figure 28 supplies the percentage of participants by gender who answered this survey question. In male participants, 36.11% chose "yes" , 32.41% chose "No" and 31.41 % participants chose "Sometime" option. In other hand, 34.04% female chose "No" and same proportion of female chose "Yes" option. 31.91% female participants sometimes feel they are addicted to mobile technology.

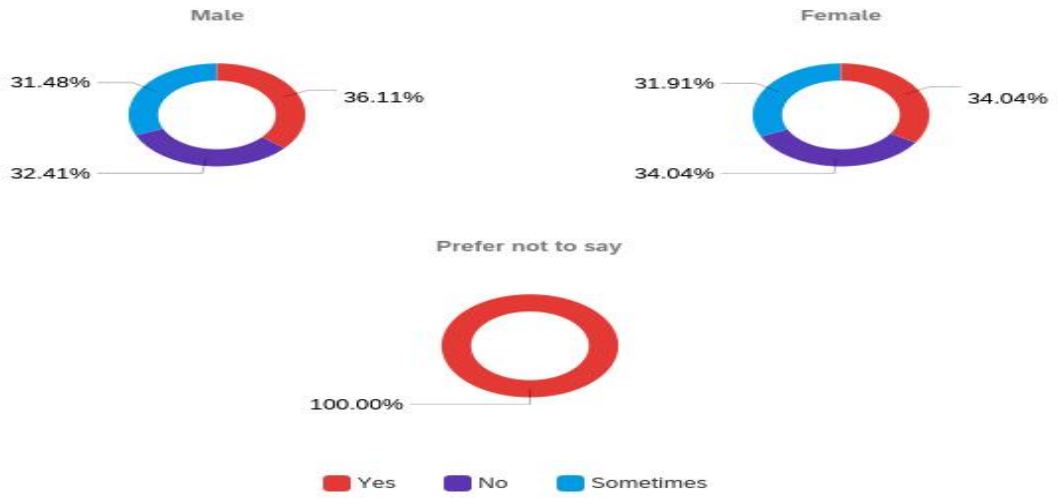

Figure29. Proportion of participants to show addiction of mobile by gender

S26: Would you recommend mobile technology to others for learning?

Below table 49 presents recommendation of using mobile technology. In total 164 participants 106 that is 64.63% recommend using mobile learning. However, 26 participants nearly 16% are not recommending using mobile technology in learning. Participants who selected maybe option that is 32 are not sure about their recommendation.

Choice	Percentage	Participants
Yes	64.63%	106
Maybe	19.51%	32
No	15.85%	26
Total	100%	164

Table44. Recommendation of participants about using mobile technology in learning

This table 49 represents recommendation of participants by gender. 110 male, 50 females and 4 prefer not to say answered this survey question. In case of male participants 71 chose "Yes",

19 participants chose "No" and 20 participants chose "Maybe" option. While, in females, 33 clicked on "Yes", 5 chose "No" and 12 participants chose "Maybe".

	Male		Female		Prefer not to say	
Choice	%	Participants	%	Participants	%	Participants
Maybe	18.18%	20	24.00%	12	0.00%	0
No	17.27%	19	10.00%	5	50.00%	2
Yes	64.55%	71	66.00%	33	50.00%	2
Total	Total	110	Total	50	Total	4

Table45. Participants' recommendation of using m learning by gender

Given Pie-charts in figure 29 provides the information about total proportion of participants by gender who gave their recommendation about using mobile technology. 64.55% males 66% females are recommended using mobile technology. This gives the output that most of the participants recommended mobile learning.

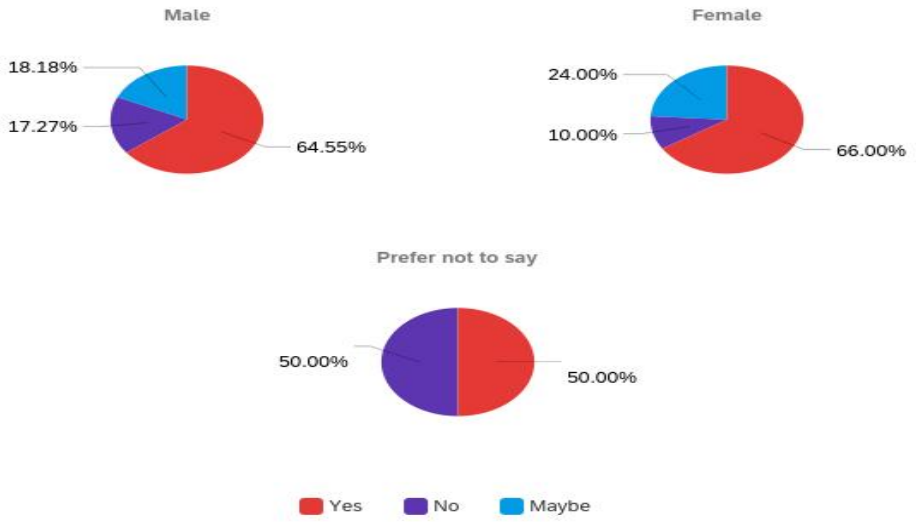

Figure30. Proportion of participants' recommendation using m-learning by gender

5. Discussion

The aim of the discussion is to present explanation of results, compare findings with literature review, and testing hypotheses. In this chapter interpretation of major findings and explanation of results related to research is discussed.

5.1 Link between research questions, literature review and results

In figure 30 illustrates the linking between literature review and sub research questions. There are two columns. On left hand side, there is a representation of literature review with literature map heading and on the right-hand side sub research questions are presented.

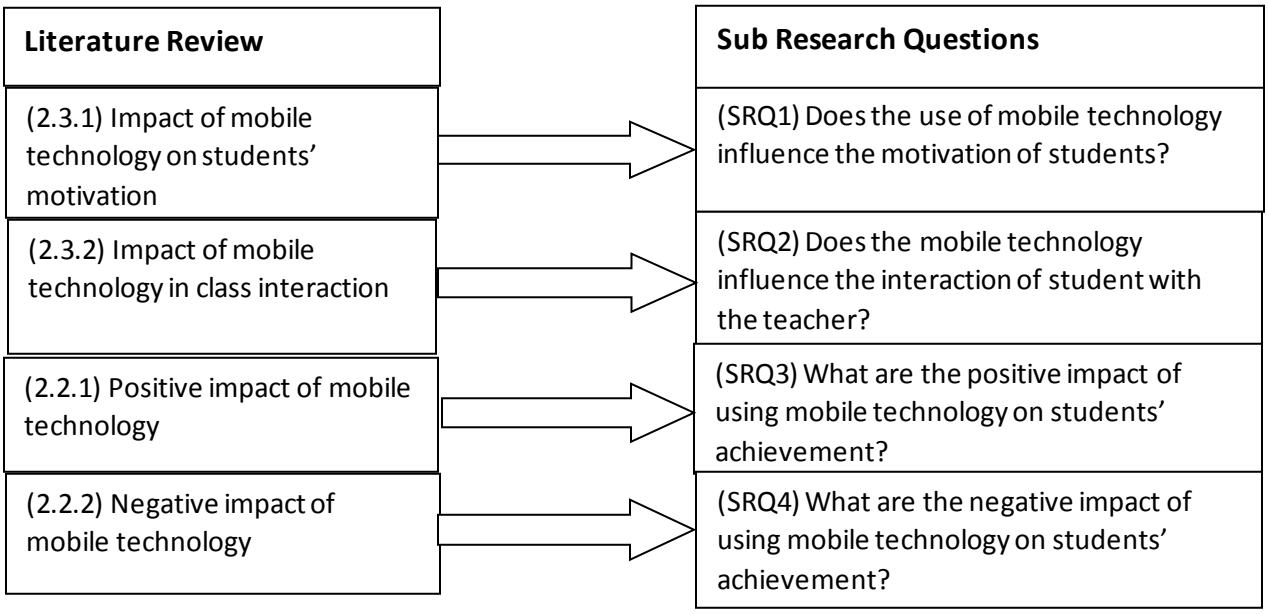

Figure31. Link between literature review and sub research questions

5.1.1 Impact of mobile technology in student's motivation

According to (Pollara, 2011) Students' motivation and involvement differ depending on their preferred learning method. Motivation is only a mental activity that cannot be viewed directly from the outside. However, it may be determined from its outcomes, such as task selection, effort, desire, perseverance, engagement, beginning and maintaining activities, and so on.

According to (Ando & Morimoto, 2009), M-learning provides more flexibility for autonomous research, pragmatic observation, professional upgrading, and on-the-spot information access,

but it also comes with a slew of drawbacks for individuals. Personalized learning and collaborative learning are supported by m - learning since it enables individuals to schedule their learning within their own time (Cheon, Lee, Crooks, & Song, 2012) . Students utilize mobile phones to study in a real-world setting, which is referred to as contextual learning (Crescente & Lee, 2011). According to Cognitive regulation, behavioral intention, and attitude positively affected learners' intentions to use m – learning.

The findings from survey questions 8,9,10,11,12, 13,14,15,21 revealed that mobile learning has a favorable impact on student motivation. These survey questions were created to determine the learners' attitudes and motivation for using mobile resources for learning.

According to data analysis of this study, mobile technology has positive impact on student's motivation as using mobile technology in learning they feel more engaged in study. Because motivating pupils, especially in typical classroom environments, may be challenging at times. They are not engaged with the instruction in this scenario, and their success rate suffers as a result. According to participants they can access materials via m-learning from their homes, on the go, or anywhere else, and they can learn at their own pace. As a result, m-learning encourages learners' motivation and engagement through its flexibility and personalized settings. Majority of student use mobile technology to their learning activities daily. According to participants, m-learning support all their learning needs. Mobile devices are convenient for them to interact with tutors and useful to completer assessment and evaluation. Moreover, mobile technology helps improving academic outcomes according to their collected responses.

The results of this study also showed that mobile learning had a favorable impact on student learning practices they can easily use to mobile devices to access learning materials.

5.1.2 Impact of mobile technology in class interaction

Mobile technology not only motivates and engages students in the learning process, but it also provides "portability," allowing students to access materials and connect with instructors and classmates from any place, but some opponent believe that because mobile technology students do not feel engaged in the class. According to (Hwang, Lai, & Wang , 2015) behavioral and academic initiatives using mobile technology Teachers face a problem in understanding and

identifying methods to incorporate technology into assessment practices in their classrooms. A study revealed that Around 95% of students feel that using mobile devices allow them to communicate with instructors and colleagues more quickly (Klimova, 2019). Other students, on the other hand, talk about how convenient it is to have all of their course materials in one small gadget (Adeboye, 2016). According to (Mohamed, Shaari, Ismail, & Yusoff, 2018) learners may do well using smart devices at first, but then drop out when they have trouble grasping the course material. Furthermore, due to mobile technologies use in the classrooms, many students are not acquiring any real experiences from their tutors.

According to this survey result, mobile devices is preferred device to communicate between students and teachers. According to survey question 12, 88% of participants believe that mobile devices provide better interaction between tutor and students which prove that it is the most convenient medium to interact with teacher and their classmates.

5.1.3 Positive impact of mobile technology

As per the literature and previous studies, there are several advantages to using m-learning in an educational setting, including its accessibility, motivational features, and social involvement. (Alkhezzi & Al-Dousari, 2016)The interactive aspect of m - learning promotes group conversations and provides immediate feedback, which reinforces learning and improves cognitive ability, and motivation for learning is mostly driven by the usage of personal devices instead of the activities themself. One of the benefits of m-Learning that has been explored is social engagement, which emphasizes the flexibility that m-Learning provides timid learners who fear interacting in class. It allows such individuals to develop themselves and express their opinions with their peers in a less stressful atmosphere (Mcquiggan, Kosturko, Mcquiggan, & Sabourin, 2015).

The data received from the survey questions 16, 18,19,20, 21 majority of respondents believe that that mobile devices useful to access information anytime at anywhere and provide better communication between students and teachers. Mobile learning has positive impact in their achievement and better outcomes according to this survey result. M learning is more

convenient method of learning in contrast of other method of learning and helps improve academic performance according to this study.

5.1.4 Negative impact of mobile technology

(Zawaideh, 2017) said “despite the potential advantages of M-Learning to students' achievements and outcomes, it also has several downsides and limits”. Usability issues are one of the key issues associated with it. This includes limitations in operating systems, physical features, network services, and the physical environment, such as difficulties in introducing applications, insufficient memory, small screen size, limited battery life, limited bandwidth, inadequacy of built-in functions, inadequate skills competence, and the difficulties of using mobiles when it is raining or when extra privacy is required. According to (Kuimova, Burleigh, Uzunboylu, & Bazhenov, 2018)during the process of learning, mobile devices also generate a lot of interruptions. To begin with, a call made throughout a class time disrupts the entire class. Moreover, when a student uses a mobile device to learn, text emails and advertisements that appear on the web may have an impact on the learner.

Participants responses in limitation of using m learning collected from the survey questions 17,22,25. According to survey question 17 majority of participants chose problem of using m learning is limited size of mobile screen and 52% of respondents believe that mobile devices are harmful in classroom. Response collected from survey question 25 showed that approximately 37% of participants chose mobile technology is an addiction.

This study found that the most of the participants chose short screen size is the most common issue in using m learning. Insufficient memory, low bandwidth, distraction in study all are issues in the consideration while adopting this technology.

5.2 Hypothesis and gathered data

H1: Gender has a significant impact on behavioral intention to use mobile learning.

In Spain (Bao, Xiong, Hu, & Kibelloh, 2013), researchers examined at gender disparities in mobile attitudes and technology-related learning choices, and found that female students had a more unfavorable mobile attitude than male students and used technology and mobile less

intensively than their male counterparts. In this research, gender has significant impact on behavioral intention to use mobile learning. According to findings of this online survey, male participants are higher than female. Survey question 3 is asked to find out the gender of the participants. Number of proportions of male respondents are more than double to female which prove that number of males more use mobile technology while studying. Men have greater mobile experience and have more positive views about mobile learning than Women, according to a large body of data (Liu, Li, & Carlsson, 2010). In terms of learning, it can be claimed that males are more inclined to utilize computers and mobile gadgets.

H2: Age has a significant impact on behavioral intention to use mobile learning.

There is a correlation between age and behavioral intention to use mobile learning. According to survey question 1 participants above age of 18 took part in this survey and people who are in the age group of 23-26 participate more in this survey. People who belong to this age group are completed their higher education or pursuing and they chose mobile learning is the best mode of learning in number of reasons. According to this data participant who belong to this age group are tech-savvy as compared to other age group.

H3: Perceived Usefulness has significant impact on behavioral intention to use mobile learning.

Mobile learning is easy method of learning, but there is some limitation of using mobile devices in learning. The perceived usefulness and ease of use of a technology have the greatest impact on a person's views and subsequent intention to utilize the system (Brezavšček, Špar, & Žnidaršič, 2017). So, there is correlation between perceived usefulness and behavioral intention using mobile technology in higher education. According to survey question, Questions 5,8,9,13,18 are related to H3 which collected data to prove that perceived usefulness has a positive impact on behavioral intention to use mobile technology.

H4: Experience of mobile devices has a significant impact on behavioral intention to use mobile learning.

Previous research indicated that students' perceived ease of use toward m-learning was Positively influenced by their experience (Mailizar, Burg, & Maulina, 2021). Perceived usefulness influenced the association between mobile technology experience and behavioral intention, according to the findings, since mobile technology experience had both a direct and indirect influence on behavioral intention. The explanation for this result is that participants would have most likely used the technology since it had already been a habit for them to utilize it without considering how easy it was to use (Mohamed, Shaari, Ismail, & Yusoff, 2018). Experience is an external variable of TAM. According to this research, survey question 8,11,16,17,20,25,26 show that perceived usefulness has positive impact on behavioral intention to use mobile technology in education.

H5: Perceived Ease of use has significant impact on behavioral intention to use mobile learning.

Previous study on mobile technology has shown significant association between perceived usefulness and behavioral intention, as well as ease of use and behavioral intention. In the research, ease-of-use concerns have long been considered an essential element influencing m-learning adoption. According to (Donnelly, 2009), M-learning has various problems including connection, restricted processing capacity, and restricted input abilities. Question number 11, 12, 13, 14, 15 prove that perceived ease of use has positive impact on behavioral intention to use mobile learning.

H6: Digital literacy has a significant impact on behavioral intention to use mobile learning.

The literature clearly showed that users' perceptions of digital literacy have a significant link with technological innovation (Jamila, Ratnawati, & Hussein, 2019). A tech - savvy person may find and comprehend what they want, openly express and share their ideas or views, and have a greater understanding of others. People with a high degree of information technologies skills, should be assured that their utilization of m learning will improve their skills since they will find it simpler to access, analyze, and adjust the systems to their own learning needs and priorities (Mohammadyari & Singh, 2015). According to survey questions 7,11,18,24 digital literacy has a significant impact on behavioral intention to use mobile technology in higher education.

H7: Willingness to use has a significant impact on behavioral intention to use mobile learning.

There is a relationship between willingness to use and behavioral intention to use mobile technology. An analysis was carried to better understand how users felt about the mobile learning environment. The study discovered that the perceived usefulness (performance expectations) of willingness to use had a significant indirect impact on user desire to utilize mobile services (Ali & Arshad , 2016). According to survey questions 5,6,7,8,23 and 26 indicate that willingness to use has positive impact on behavioral intention to use mobile learning.

H8: Perceived ease of use has a significant impact on perceived usefulness.

Perceived ease of use is a major important variable, according to the m-learning literature (Davis, 1989). Other research has supported up the idea that perceived ease of use has a direct impact on perceived usefulness. According to this research, perceived ease of use has a significant impact on perceived usefulness. As a result, this hypothesis is tested. M-learning systems are crucial because they give in depth help to users at all times and from any location (Sanjebad, Shrestha, & Shahid, 2020). Furthermore, these technologies can help students and instructors form and maintain relationships. According to this research, survey questions 20,21,22,23,24 are related to test this hypothesis that prove that perceived ease of use has a positive impact on perceived usefulness.

H9: Perceived usefulness has significant impact on perceived ease of use.

Perceived usefulness, according to Davis, is the degree to which the individual feels that utilizing a certain system would improve his or her work efficiency (Davis, 1989). If he or she believes the technology or system will benefit her or him, then the technology or system has a very high degree of acceptability. Otherwise, he or she will oppose using the system or technology, results in techno-stress. Survey questions 18,19,20,21,8,9 were asked to test this hypothesis which proved that perceived usefulness has a significant impact on perceived ease of use.

H10: Behavioral Intention to use mobile learning has a positive impact on actual use.

According to the findings, behavioral intention to use M-learning has a strong impact on actual use. For test this above hypothesis questions 11,12,13,14,19,20,21,22 were asked in survey which showed that behavioral intention to use mobile learning has a positive impact on actual use. This indicates that a participant's behavioral intention is a key factor in how the technology is used. The research also demonstrates that m-learning's ease of use has a significant impact on behavioral intentions to adopt it. Furthermore, perceived M-learning service usefulness has a large indirect influence on both behavioral intention to use and actual usage, as well as a considerably favorable direct influence on perceived M-learning usefulness. The analysis also demonstrates that perceived usefulness has a direct and considerable impact on behavioral intention to use, as well as an indirect impact on actual usage.

6. Conclusion

According to the survey results, mobile learning can engage students to learn. According to the respondents, they want to be able to use their mobile devices to access all key course resources as well as execute a wide range of learning activities.

This study revealed that mobile technology plays an important role in student learning. It is very beneficial in improving student learning achievements and outcomes. According to data analysis of this study, mobile technology has positive impact on student's motivation. Majority of student use mobile technology to their learning activities daily. According to participants, m-learning support all their learning needs. Mobile devices are convenient for them to interact with tutors and useful to complete assessment and evaluation. Furthermore, mobile technology helps improving academic outcomes according to findings. Students can keep on top of things, make better use of their time, and be more motivated to study if they have mobile access to educational resources. So, based on the findings of the study, it has been found that using mobile devices increases students' motivation.

6.1 Limitations

One of most significant issues for this study undertaking was a lack of time for data collection. A four-week time has given to collect the responses for this research project. A four-week period would be insufficient to obtain appropriate findings and results. Because of short period of time span a smaller number of responses were collected by online survey. Unfortunately, limited tool was used by researcher to analyses the responses.

Because the data was collected via an online survey, it's possible that respondents were misleading or biased in their responses, resulting in biased results. Also, in order to finish the survey as fast as possible, participants may pass over the questions and finding options, and picking an answer that may be incorrect.

In addition, this research was a quantitative research. Therefore, additional qualitative questions may be added in the future for improved data collecting quality, which might aid in identifying and understanding the opinions of students.

Moreover, the scale and diversity of the target population, as well as the lack of a comparison group, are limitations of this study. Future additional study with a bigger and more diverse sample is needed to clarify the current findings and investigate the link with achievements and learning outcomes.

6.2 Future work

Though m - learning may never totally replace conventional learning, when implemented appropriately, it may enhance the value of traditional educational methods. While formulating a mobile teaching method, it's critical to examine users' motivation for mobile technologies, since their perspectives have a big impact on their desire to use it. Therefore, the current research investigated the effect of mobile technology on student achievement. Future study can be performed to see how well other user related to this technology such as faculty, students and programmers adopt this mobile technology. Researchers would be able to open their minds in this subject by analyzing the perspectives of all users. More studies should be conducted in the upcoming to transform education through mobile technologies. Whatever teachers and academic institutions do, the introduction of new types of technology disrupts education. As a result, maintaining optimal use and adoption of mobile learning needs a detailed pedagogical and technological examination.

7.References

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8.Appendix

A1: Survey Questions

The survey questions for this research project is given below:

Survey Question No	Survey Question					
Q1	Are you more than the age of 18?					
	☐ Yes	☐ No				
Q2	What is your age group?					
	☐ 18-22	☐ 23-26	☐ 27-30	☐ 31-35	☐ 36-49	☐ 50+
Q3	What is your gender?					
	☐ Male	☐ Female	☐ Others			
Q4	Have you completed or pursuing higher education?					
	☐ Yes	☐ No				
Q5	What is your preferred device for academic work?					
	☐ Laptop	☐ Mobile	☐ PC	☐ Tablet		
Q6	How long have you been using mobile phones to access your educational content?					
	☐ 0-1 years	☐ 2-3 years	☐ 4-5 years	☐ 5+ years		
Q7	What is your frequency to use mobile phones in learning activities?					
	☐ Sometimes	☐ Always	☐ Never			
Q8	How satisfied were you while accessing learning material on mobile devices?					
	☐ Extremely satisfied	☐ Satisfied	☐ Neither	☐ Dissatisfied	☐ Extremely dissatisfied	
Q9	Do you think mobile devices are useful in accessing learning materials?					

	☐ Extremely useful	☐ Useful	☐ Neither	☐ Useless	☐ Extremely useless

Survey Question No	**Survey Question**				
Q10	How long do you use mobile devices, on average, to access learning materials in a day? (on average)				
	☐ 0-3 hours	☐ 4-7 hours	☐ 8-11 hours	☐ 12-15 hours	☐ More than 15 hours
Q11	Do you believe mobile technologies support your learning needs?				
	☐ Yes	☐ No	☐ Maybe		
Q12	Is mobile technology helpful while communicating with your classmates and teachers?				
	☐ Yes	☐ No	☐ Maybe		
Q13	Is mobile technology useful in completing assessments and evaluations?				
	☐ Extremely useful	☐ Useful	☐ Neither	☐ Useless	☐ Extremely useless
Q14	Does mobile technology help in improving your academic outcomes?				
	☐ Yes	☐ No	☐ Sometimes		
Q15	Does mobile learning help in gathering information and conducting research?				
	☐ Yes	☐ No	☐ Sometimes		
Q16	What are the benefits offered by mobile learning, if any?				

	☐ Better communication with classmates and educators	☐ Portability of devices	☐ Improved cooperation among peers	☐ User-friendly	☐ Economical as compared to other learning devices	☐ Accessibility of information on anytime and anywhere	Others
Q17	What are the challenges faced while using mobile learning, if any?						
	☐ Short screen size	☐ Insufficient memory and storage	☐ Distraction	☐ Low speed and bandwidth	Others		

Survey Question No	**Survey Question**				
Q18	How would you rate your achievements using mobile technology as a student?				
	☐ Brilliant	☐ Above average	☐ Average	☐ Below average	☐ Poor
Q19	Is mobile technology helps to improve your academic performance?				
	☐ Yes	☐ No	☐ Sometimes		
Q20	In comparison to other learning methods, is mobile learning relatively cheap?				
	☐ Yes	☐ No	☐ Maybe		
Q21	Is it more convenient to use m - learning in contrast to other learning approaches?				
	☐ Yes	☐ No	☐ Maybe		

Q22	Do you think using mobile devices can be destructive in class?				
	☐ Yes	☐ No	☐ Maybe		
Q23	Do you prefer mobile technology as a method of learning?				
	☐ Yes	☐ No	☐ Maybe		
Q24	For what purposes do you use mobile technologies the most?				
	☐ To use social networking	☐ To check e-mail	☐ Playing games	☐ Finding study resources	☐ Others
Q25	Do you think you are addicted to mobile technology?				
	☐ Yes	☐ No	☐ Sometimes		
Q26	Would you recommend mobile technology to others for use in learning?				
	☐ Yes	☐ No	☐ Maybe		

A2: Wintec Ethics Form

Wintec WAIKATO INSTITUTE OF TECHNOLOGY Te Kuratini o Waikato	**Research and Postgraduate Office (RPGO)** **Human Ethics in Research Group (HERG)**

LOW-RISK HUMAN ETHICS IN RESEARCH APPLICATION FORM

Please refer to the Ethics Guidelines before completing this application.

The RPGO is located at the City Campus, D-Block (Offices D2.22 – D2.24), e-mail research@wintec.ac.nz or phone Megan Allardice on Ext. 3582 for more information.

Please see the last page of this document for detailed instructions for completing this form.

1.0 PROJECT TITLE	
	The impact of mobile technology on students' achievement in higher education

2.0 RESEARCHER(S)		
2.1	Primary researcher's name	Neha Rani
2.2	School//Centre/Unit	Centre of Business and Information Technology
2.3	Contact Details (Telephone and E-mail)	Telephone: 0221952494 E-mail: nehran24@student.wintec.ac.nz
2.4	Is this application a:	☒ Student Application ☐ Staff Application
2.5	If this is a student application, please provide the Module code here	INFO901
2.6	Is this project a staff application that utilizes work partially or wholly undertaken by students who are not participants (e.g.,	Not applicable

	data collection undertaken by a researcher's class)?	
2.7	If so, please clearly describe what the role of these students to be in this research is, what work will be used for explicitly (including any issues regarding authorship of research outputs such as journal articles), and what steps have been taken to ensure students are aware of this.	Not applicable
2.8	Name of other Researcher(s) and positions. (If this is a student application, please provide the name(s) of the project supervisor(s) and indicate that they are supervisors here.)	Dr. Monjur Ahmed Dr Michael Bosu
2.9	Contact Details of other researchers and supervisors (Telephone and E-mail)	Telephone: E-mail: monjur.ahmed@wintec.ac.nz michael.bosu@wintec.ac.nz
2.10	Is this application:	☒ A new application ☐ A subsequent approval request following a significant change to an already approved application

3.0 PROJECT TIMELINE

The projected start date for **data collection** *(once this ethics application is approved. Please note, projects can only begin once applications have been approved, regardless of the level of risk)*:

Projected end date: End of semester

4.0 PROJECT SUMMARY (please include your research purpose and objectives, methodology will be dealt with in Section 6)

This study aims to understand mobile technology's role in the educational world and identify mobile technology's role in transforming the way of learning and the impact of mobile technology students' achievement and motivation. The research will also focus on the negative and positive effects of mobile technology on higher education and would try to examine whether mobile technology also affects students ' overall performance or not.

5.0 PROJECT METHODOLOGY (including methods for data collection)

An online survey method is used to collect the data and information regarding mobile technology from the students in tertiary education/ A population density of 175240 with a confidence interval of 4 and a confidence level of 95 percent, therefore obtaining a sample size of 599, would be considered for this research. To define the reasons that motivate students to adopt mobile technology in higher education, a research framework focused on Davis' Technology Acceptance Model is used, and analyzed online resources to examine the outcomes and provide solutions to the research questions.

6.0 CONSIDERATON OF ETHICAL ISSUES AND PROCESSES

The following ethical issues and processes is taken into consideration while undertaking this research project:

Risk of harm

This research's primary objective is to identify the impact of mobile technology on students' achievement in higher education. The survey is conducted online to collect the data from participants. The surveys only include questions related to users experience with online learning.

Informed and voluntary consent

In this research, the consent is taken from students, and all the required information is provided to users before beginning the Survey. All participants is to be informed about the topic and objective of the research before the research questions. The research only allowed participants who are above 18 years of age.

Privacy and confidentiality

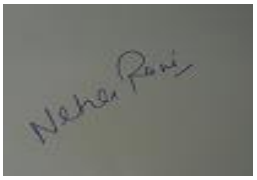
The Survey is designed in such a manner that none of the questions reveals the identity of a user or any personal information.

the collected responses is stored in a password protected machine and will be deleted after 3 months of the research.

Conflict of interest

For the writer, there are no conflicts of interest.

Researcher(s) signature(s) (the <u>name and signature</u> of all researcher(s) are to be included):

Name	Signature	Date
Neha Rani		

Primary Supervisor's signature (if this is a student application):

Name	Signature	Date
Dr. Monjur Ahmed		

Research Leader's signature:		
Name	**Signature**	**Date**
Dr. Monjur Ahmed		

HERG Chairperson or delegated representative's signature (RPGO use only):		
Name	**Signature**	**Date**

COMPLETING THIS FORM

Please note: A low-risk research project is one in which the nature of the potential/actual risk of harm to participants or the researcher is minimal and no more than is generally encountered in daily life. As a staff member, you are new to research or are in any doubt about which application to submit. Please consult with your Research Leader. If you are a student, your supervisor will be able to give you advice. If you are still in any doubt, don't hesitate to consult the RPGO.

Specific Instructions

- All questions are to be answered. Note the questions within require a mix of descriptions, yes/no answers and cross the box (**Double-click on checkboxes with your mouse and select 'Checked' from the options under 'Default Value'**).
- Research Leaders need to review the information in this form and sign it off before the application being made to the RPGO.
- Please forward one signed original copy to the RPGO, together with an electronic version to research@wintec.ac.nz.
- Low-Risk Human Ethics in Research Applications also need to be accompanied by a copy of the Information Sheet, Consent Form, and any Questionnaires or Interview Schedules for consideration. If Questionnaires/ Schedules are not yet confirmed, please supply the latest draft.
- No questions are to be deleted, even those that you feel you are not required to answer.
- No part of the research requiring ethical approval should commence before approval being confirmed.
- Applicants will receive official confirmation of submission via e-mail from the RPGO once all conditions of this form have been completed.
- If you want to apply for an extension on a previously approved project, please contact the RPGO, as you will probably not need to submit a separate application.

- Applicants will be advised of the outcome of their application to the Human Ethics in Research Committee **no later than ten working days** after the completed and confirmed submission of this application.

HUMAN ETHICS IN RESEARCH LOW RISK APPLICATION FORM - CHECKLIST	
Research project title:	**The impact of mobile technology on students' achievement in higher education**
Name of primary researcher:	**Neha Rani**

Attached, please find (as applicable) in the order listed below.	
Completed HERG Low-Risk Application Form	☒ Yes ☐ No
Consent Form for participants	☒ Yes ☐ No
Information Sheet for participants	☒ Yes ☐ No

Copy of Focus Group Questions, Interview Schedule, or similar	☒ Yes ☐ No

Participant Information Sheet

Project Title: The impact of mobile technology on students' achievement in higher education

Institution: Wintec, Hamilton City Campus

Researcher: Neha Rani

About the survey

It is my polite invitation to take part in this research project by filling this online survey.

Please take a moment to review the following details when you go forward, which will help you understand this research's intention and what it will include. Thank you.

Purpose of this research

This research project aims to understand the role of mobile technology on the educational world and identify what is the role of mobile technology to transform the way of learning, and what is the impact of mobile technology student' achievement and motivation, and would try to examine whether mobile technology also affects students ' overall performance or not. An online survey will be conducted to gather the students' opinions about using mobile technology in learning.

About the researcher

This research project's primary researcher is Neha Rani, who is pursuing a Master in Applied IT from Wintec City Campus.

This is a self-funded project which is part of the academic module, and your participation in this research study would not give the researcher any personal financial benefits.

Expectation from participants

Since you are 18 years of age or over, and are studying or have completed your tertiary education, and have used mobile devices for your academics, you are requested to engage in this study.

Duration of the survey

This online survey will only take maximum of 20 minutes to complete this survey.

Explain where the data will be collected

To collect information, an online survey such as google forms will be used.

What will happen to the information provided?

The information collected by you will be analyzed and contribute to the results of the study. All information is stored online with the protection of login credentials.

Do you have to participate?

It is up to you to decide whether you wish to participate, so this online survey's participation is voluntary. However, you can retain a copy of the survey form you filled out, so if you change your mind and want to withdraw your participation, you can do it without providing any reasons.

Will your participation be kept confidential?

The survey information collected by you will be kept confidential. You may be guaranteed that your identification will not be revealed in any manner.

Participation Acknowledgement

Your engagement, as well as the details you filled out, will be kept confidential. The outcomes of the study will, however, be available at the request of every participant.

Research availability?

In the final project, the study findings will be published. If you want to receive a copy of the report, you can send an e-mail requesting a full report to the mentioned address at the end of this form.

Contacts for further information

Neha Rani

Primary Researcher

Student at Waikato Institute of Technology Pursuing Masters in Applied IT

E-mail id: nehran24@student.wintec.ac.nz

Residential address: 25/1 Abbotsford Street,3200, Waikato, New Zealand

Contact number: 0221952494

Dr. Monjur Ahmed

Primary Supervisor

Staff at Waikato Institute of Technology

E-mail id: Monjur.Ahmed@wintec.ac.nz